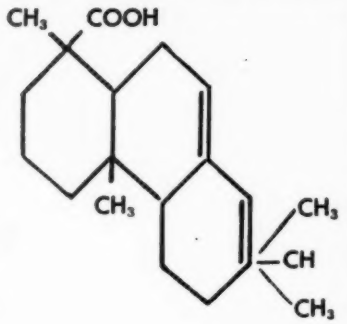
PAINT and VARNISH Production

THE TECHNICAL MAGAZINE FOR MANUFACTURERS OF PAINT, VARNISH, LACQUER AND OTHER SYNTHETIC FINISHES

NEWPORT ROSINS

World's Most Abundant, Lowest Cost Organic Acid



We'll bet you never knew that rosin could be offered in so many useful ways to the Paint Industry.

Newport Industries Co.

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Wood Rosins—all grades
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A Division of Heyden Newport Chemical Corporation

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1959
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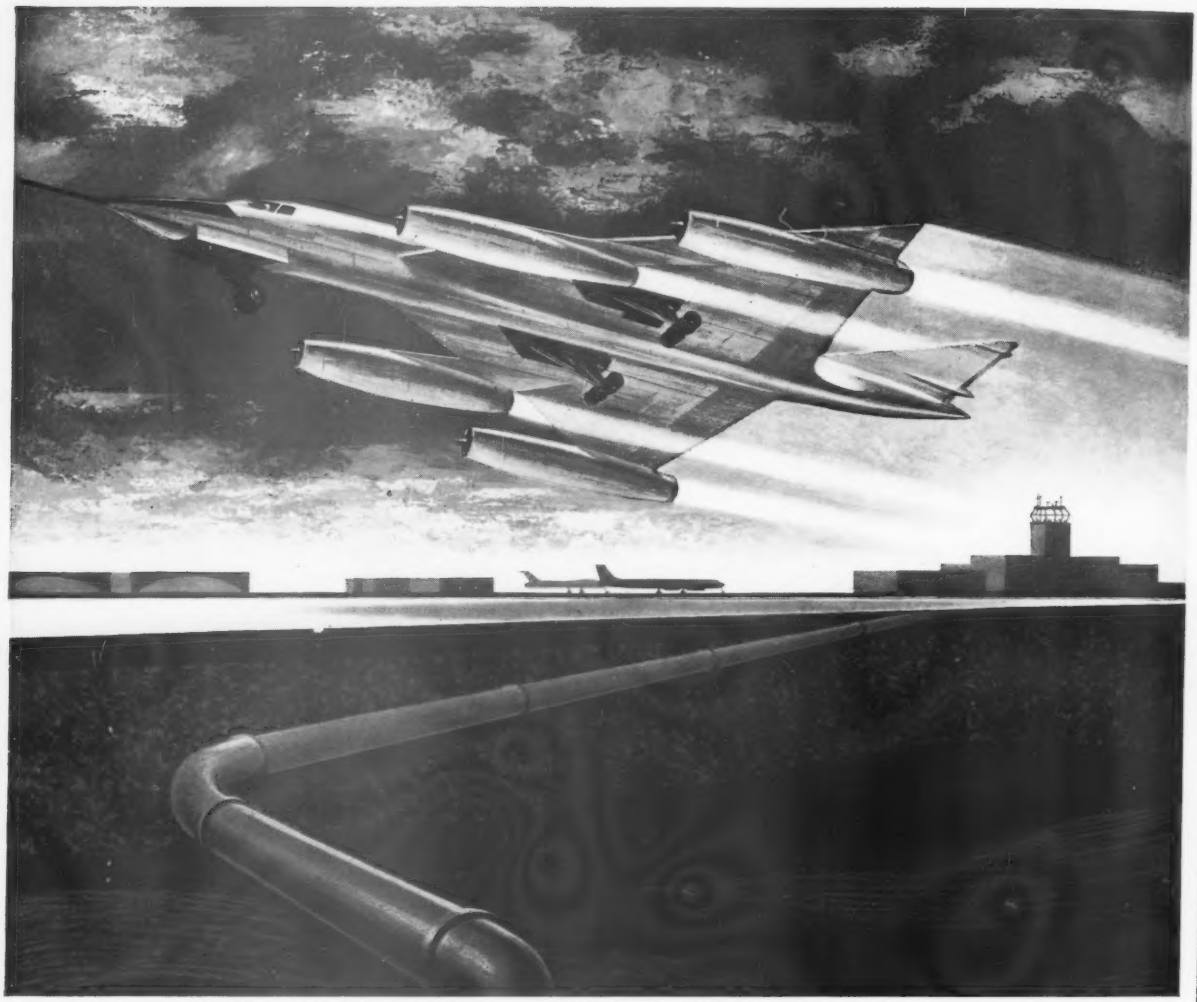

EPON® 828 . . . from TOP to BOTTOM,

the recognized performance standard for liquid epoxies

Ever since its introduction a decade ago, Shell Epon 828 has set the pace as a uniform thermosetting plastic with a remarkably wide range of applications . . . from high-flying missiles to underground glass fiber pipe and pipe coatings. No other resin polymer combines such outstanding uniformity with *so many* other desirable properties.

A pourable liquid at room temperature, Epon 828 is a 100 per cent reactive resin that gives unexcelled performance in wet lay-up laminating of glass fiber, in potting and encapsulating electronic components, in casting, and in surface coating. In adhesive formulations, Epon 828 makes extremely strong bonds with metal, wood, glass, and many plastics . . . stronger often than welds or rivets.

Epon 828 is used in the manufacture of many products, new and old, such as boats, tools and dies, aircraft, commercial adhesives, and vinyl stabilizers. It is a principal ingredient in surface coating formulations that give films of almost unparalleled resistance to abrasion, impact and the attack of solvents, alkalis, and acids. A new and fast-growing use is in industrial floor surfacing compounds.

* * *

The unequalled uniformity of Epon 828 assures formulators of this wide range of applications. Only Shell Chemical offers you a *complete* line of epoxies. Write to your nearest Shell Chemical district office.

Epon puts the power in plastics

SHELL CHEMICAL CORPORATION

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IN CANADA: Chemical Division, Shell Oil Company of Canada, Limited, Toronto

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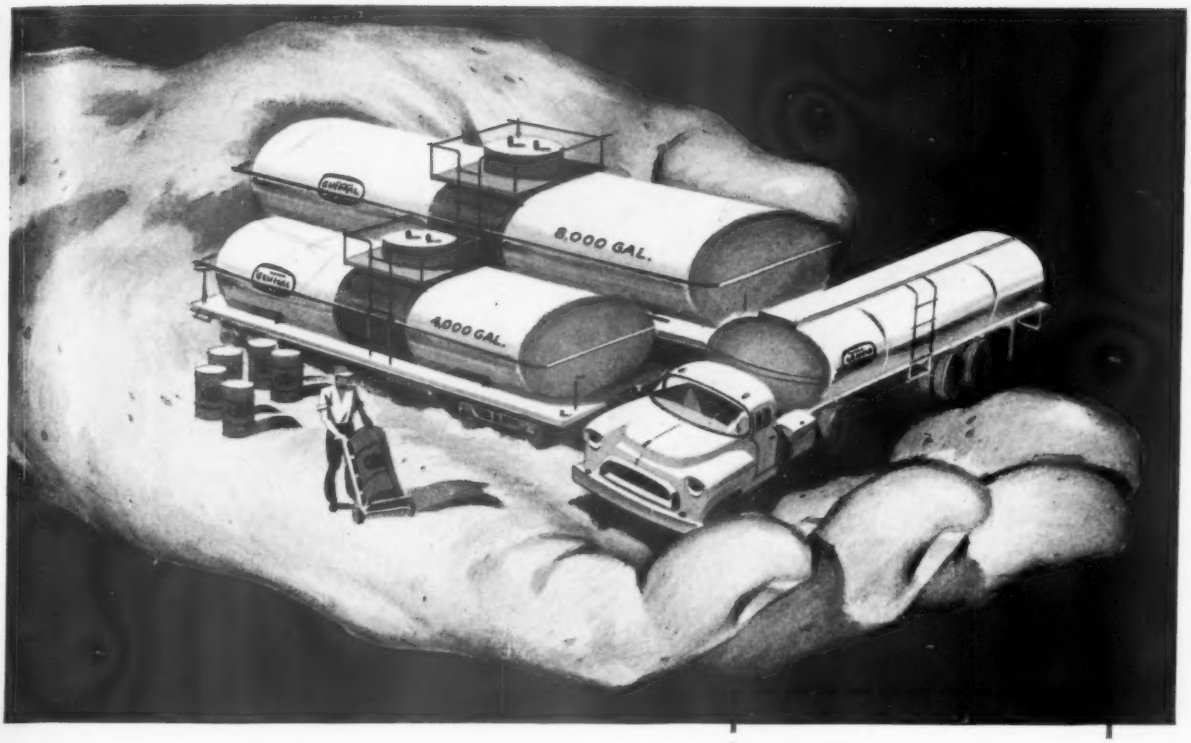

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GEN-FLO® OFFERS BOTH TOP QUALITY AND INDIVIDUALIZED SERVICE

To help you keep latex inventories within reasonable limits, Gen-Flo is available in shipments tailored to fit *your* production requirements. Whether your need is for drum, tank truck, or tank car quantities, Gen-Flo is ready to serve you now!

Gen-Flo, the "balance-controlled" styrene-butadiene latex, comes from an ultra-modern plant, where it is carefully produced and thoroughly tested by skilled technicians to assure the ultimate in quality and uniformity. Prove Gen-Flo's excellence in your own paint formulations — write today for literature and a generous sample of Gen-Flo . . . the latex that *makes* outstanding paints.

FACTS YOU SHOULD KNOW ABOUT GEN-FLO

Available in shipments tailored to your operation, Gen-Flo offers these physical characteristics:

Viscosity—cps.	—	21
Residual styrene %	—	0.03
Odor	—	Extremely mild
Mechanical stability %	—	0.03
Film specs	—	Good
Stabilization System	—	Balanced

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CHEMICAL DIVISION
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NO DISCOLORATION WHEN OVERBAKED UP TO 350°F.
CHEMICAL RESISTANCE SUPERIOR TO THAT OF AMINE MODIFIED ALKYDS
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BETTER GLOSS AND GLOSS RETENTION ON OVERBAKE
Interested in a One-Coat Metal Baking Finish with conversion characteristics like these?

Photo courtesy J. O. Ross Engineering Division Midland-Ross Corp.

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LUSTRASOL 4290-50

RCI's baking acrylic copolymer

This new Reichhold vehicle has been developed specifically for the formulation of one-coat baked metal finishes combining a high degree of chemical resistance with outstanding durability. Its adhesion to both bonderized steel and aluminum particularly qualify it for use in coatings for metal furniture, metal kitchen cabinets, electric fans and other small appliances. For further information including specifications and starting formulae, write for Bulletin SC-34.

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VOL. 49 SEPTEMBER, 1959 NO. 10

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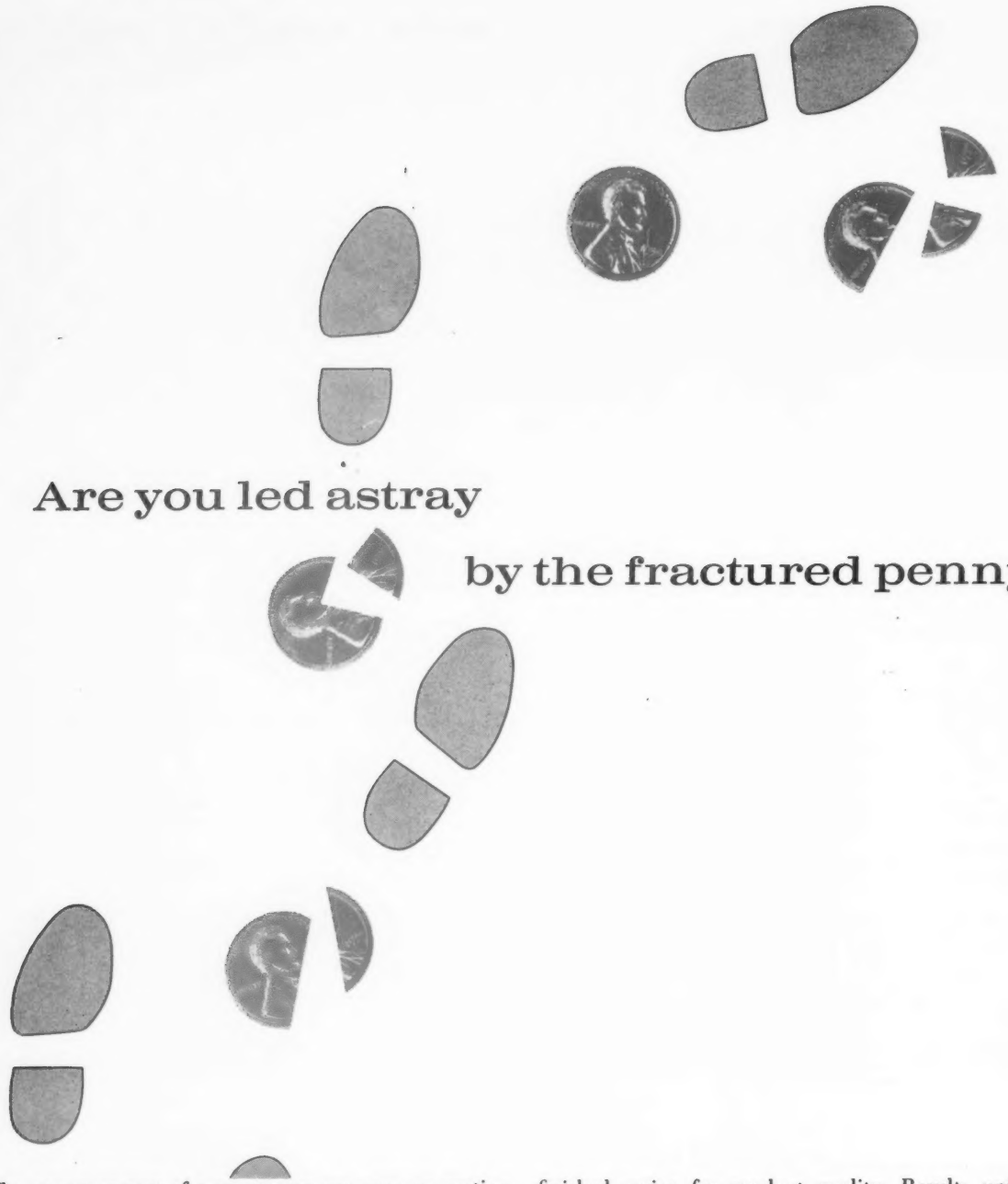
NEXT ISSUE

Our October Special Convention issue will carry a comprehensive article on the use of material handling in paint manufacture. This exclusive feature will consist of specially prepared articles covering conveyors, fork trucks, hoists and overhead equipment, warehousing, hand equipment, pallets, and pumps.

MEMBER BUSINESS BPA PUBLICATIONS AUDIT, INC.



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PLASTICS AND COAL CHEMICALS DIVISION
40 Rector Street, New York 6, N. Y.

Allied Chemical

EDITORIAL COMMENT

Our Special October Issue

IN the wake of rising labor costs, material handling has become a very important aspect of production. It adds nothing to the product, but cost. Furthermore, it affects the overall distribution and selling of the product itself.

Because of these facts, management is taking a closer look at material handling costs and insisting on the use of more efficient and economical handling systems in plant operation.

Within the last decade, the consumption of paint has risen steadily. Moreover, the number of different paint product demanded by both industry and the home owner has risen precipitately. To cope with these demands, the paint manufacturer, out of necessity, had to add new lines of products in a variety of colors and package sizes. As a result, problems in material handling and storage arose which could only be solved through modernized handling systems.

In this connection, our October Special Convention Issue will feature an interesting and comprehensive feature on modern material handling systems and how these systems can be applied in the manufacturing cycle of paints. This exclusive feature will consist of a series of articles prepared by material handling experts who will discuss fork trucks and hand trucks, hoist and overhead equipment, conveyors and belts. Warehousing covering palletization, racks and storage equipment, and pumps for transporting liquid materials will also be discussed.

As paint production men, it behooves you to know your labor costs in the handling and storing of raw materials and finished products. To learn what you can do about reducing these costs in your plant, we strongly recommend that you read and study our special feature on material handling appearing in the October issue of *Paint and Varnish Production.*

Color and Satellites

THE idea of using heat sensitive coatings for satellite skins to control internal temperature on space vehicles is now possible, according to R. X. Meyer, a scientist with Space Technology Laboratories, Inc. The coating will change color, thereby controlling the heat absorption and radiation qualities of the satellite. The idea is based on the well-known phenomenon that light colors reflect heat while dark ones absorb it.

According to Meyer, this new coating will automatically keep the temperature inside the vehicle's shell uniform. As the temperature of the satellite increases, its skin would become light in color, thereby allowing more heat to be reflected into space. Should the internal temperature take a downward turn, the skin would become dark in color, thereby absorbing more radiation.

The development of a satisfactory vehicle for transporting man to outer space undoubtedly requires the application of all possible physical phenomena. The physical attributes of both coating materials, and particularly, color, are helping in some small measure toward the realization of this important achievement.

Your Attendance is a Must

NEXT month the National Paint, Varnish and Lacquer Association and the Federation of Paint and Varnish Production Clubs will hold their annual meetings in Atlantic City, the week of October 19-24. The Association will meet during the first part of the week, October 19-21. The Federation and the Paint Industries' Show will be held during the latter part of the week, October 22-24.

Both organizations have arranged very informative programs, appealing to all managerial levels of the paint industry.

The 1959 Paint Industries' Show will include some 106 exhibitors occupying more than 20,000 square feet of exhibit area—making this years' show the largest ever presented.

Jot down the dates, October 19-24, and plan to spend a few days in Atlantic City during this important week. *It will be well worth your time.*

National NADONE®

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the highest quality you can get in any quantity you can use!

The highest-quality, volume-production Cyclohexanone offered . . . that's still the seven word story of NADONE. *Minimum* purity is now 99.7% but individual shipments regularly better this high standard.

Our Hopewell, Va. plant employs an advanced direct continuous process developed by National Aniline research. It is integrated back to basic raw materials within the Allied Chemical group and well located to serve the resin, plastics, coatings and chemical industries. Drum stocks also available in principal cities.

Have you investigated the benefits of using this high-power solvent to improve your solvent system? In terms of its performance ability, it is attractively priced for many specialized uses.

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We'll be glad to send you a working sample, price quotation and our 24-page Technical Bulletin #1-19.

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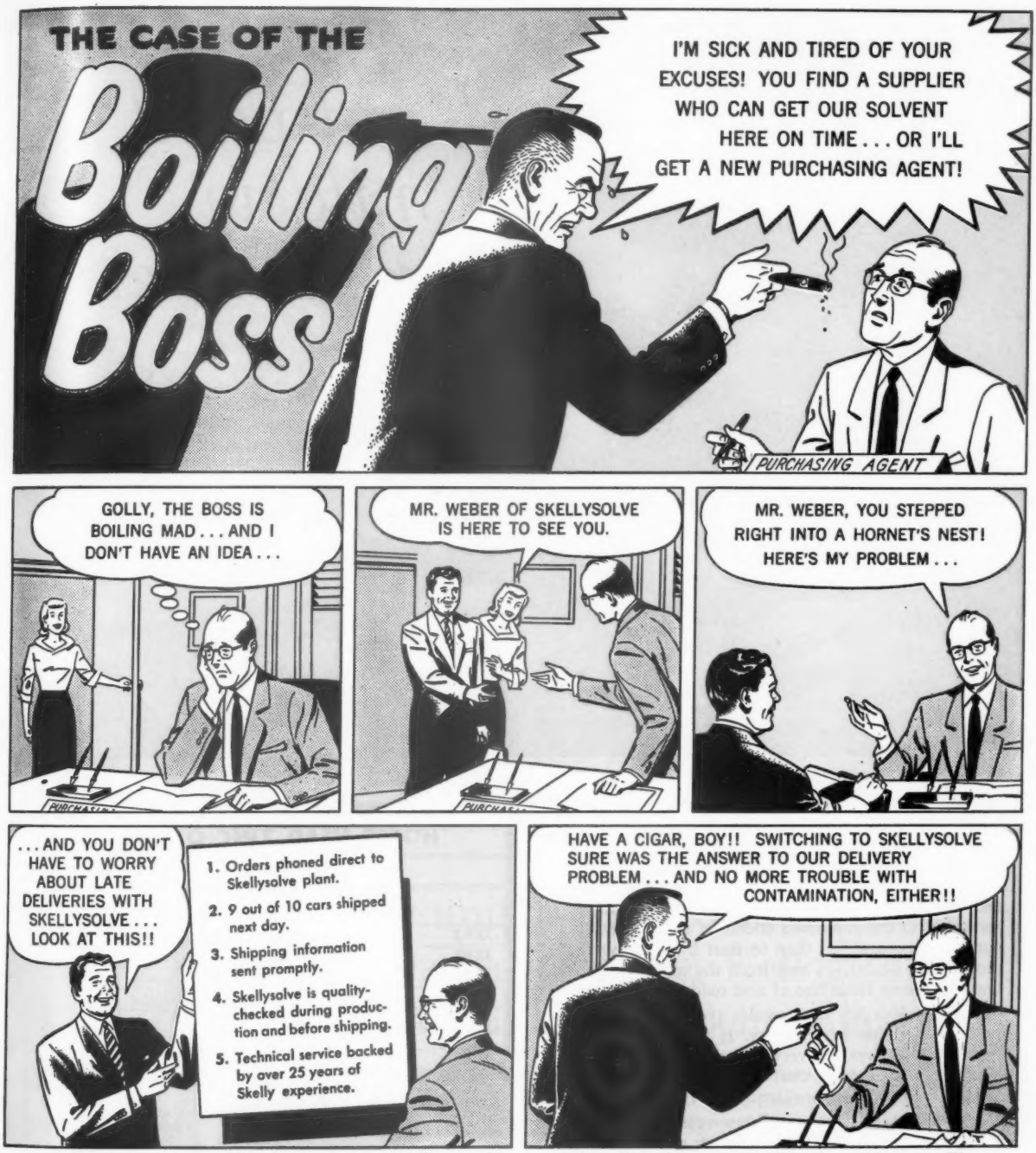
THE CASE OF THE
Boiling Boss
I'M SICK AND TIRED OF YOUR EXCUSES! YOU FIND A SUPPLIER WHO CAN GET OUR SOLVENT HERE ON TIME . . . OR I'LL GET A NEW PURCHASING AGENT!
PURCHASING AGENT
GOLLY, THE BOSS IS BOILING MAD . . . AND I DON'T HAVE AN IDEA . . .
MR. WEBER OF SKELLYSOLVE IS HERE TO SEE YOU.
MR. WEBER, YOU STEPPED RIGHT INTO A HORNET'S NEST! HERE'S MY PROBLEM . . .
. . . AND YOU DON'T HAVE TO WORRY ABOUT LATE DELIVERIES WITH SKELLYSOLVE . . . LOOK AT THIS!!
1. Orders phoned direct to Skellysolve plant.
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4. Skellysolve is quality-checked during production and before shipping.
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HAVE A CIGAR, BOY!! SWITCHING TO SKELLYSOLVE SURE WAS THE ANSWER TO OUR DELIVERY PROBLEM . . . AND NO MORE TROUBLE WITH CONTAMINATION, EITHER!!

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SKELLYSOLVE-L. A quick-evaporating lacquer diluent of exceptionally sweet odor. Closed cup flash point about 12°F.

SKELLYSOLVE-S. Low end point mineral spirits for thinning paints, varnishes, and polishes. Closed cup flash point about 103°F.

SKELLYSOLVE-S2. A quick-evaporating mineral spirits. Closed cup flash point about 101°F. Excellent for industrial paints and for polishes and waxes.

SKELLYSOLVE-V. Narrow boiling range VM&P naphtha. Excellent for dip and spray enamels. Closed cup flash point about 50°F.

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Ask about our new Skelly Petroleum Insoluble Grease and wide range of aromatics.

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TULSA, OKLAHOMA

Industrial Division:

605 West 47th Street, Kansas City 41, Mo.

What is the best paint for mildew resistance?

Results of mildew resistance tests on various test fence panels receive careful examination in the laboratory.

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By every test . . . on test fence, garage or house . . . in whatever the location . . . paints containing adequate quantities of zinc oxide always display the greatest resistance to mildew formation.

Can you think of a better way to formulate mildew-resistant paints . . . as well as paints offering maximum resistance to the combined effects of *all* elements of outdoor exposure . . . than to start by selecting the proper zinc oxide . . . and from the most complete line—the Horse Head line of zinc oxides?

Try XX-602. It's the acicular type – free of colloidal fines – low in reactivity. It provides superior durability. It gives the very highest consistency – as much as 10 K.U. more than conventional zinc oxides. And it is uniform in consistency.

In formulating your mildew-resistant paints, XX-602 also provides the many other special properties needed in top-quality outside house paints – and generally at a saving in formulation cost.

HORSE HEAD® ZINC OXIDES

HORSE HEAD ZINC OXIDES
LEAD-FREE

Brand	Relative Particle Size	Particle Shape	Oil Demands
XX®-2	Fine	Nodular	16
XX-50	Medium	Nodular	13
XX-55	Fine	Nodluar	16
XX-503	Large	Nodular	10
XX-505	Medium	Nodular	15
XX-601	Medium	Acicular	14
XX-602	Fine	Acicular	20

LEADED

Brand	Relative Particle Size	Particle Shape	Oil Demands
LEHIGH®-6 (35% Leaded)	Med. Large	Nodular	11
LEHIGH-61 (35% Leaded)	Medium	Nodular	14
LEHIGH-112 (12% Leaded)	Medium	Nodular	10
LEHIGH-118 (18% Leaded)	Medium	Nodular	9
LEHIGH-250 (50% Leaded)	Medium	Nodular	12
LEHIGH-635 (35% Leaded)	Medium	Acicular	13

THE NEW JERSEY ZINC COMPANY

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75 pounds of Celite are mixed in every 100 gallons of Spencer-Kellogg's Cykelin 70 based gray shingle and shake paint. For full details write for Shingle and Shake Paints bulletin. Address Spencer-Kellogg and Sons, Inc., Buffalo 5, New York.

In exterior flat paints tint retention is a must!

For uniform flatness and chalk resistance Spencer-Kellogg's formula calls for Celite diatomite

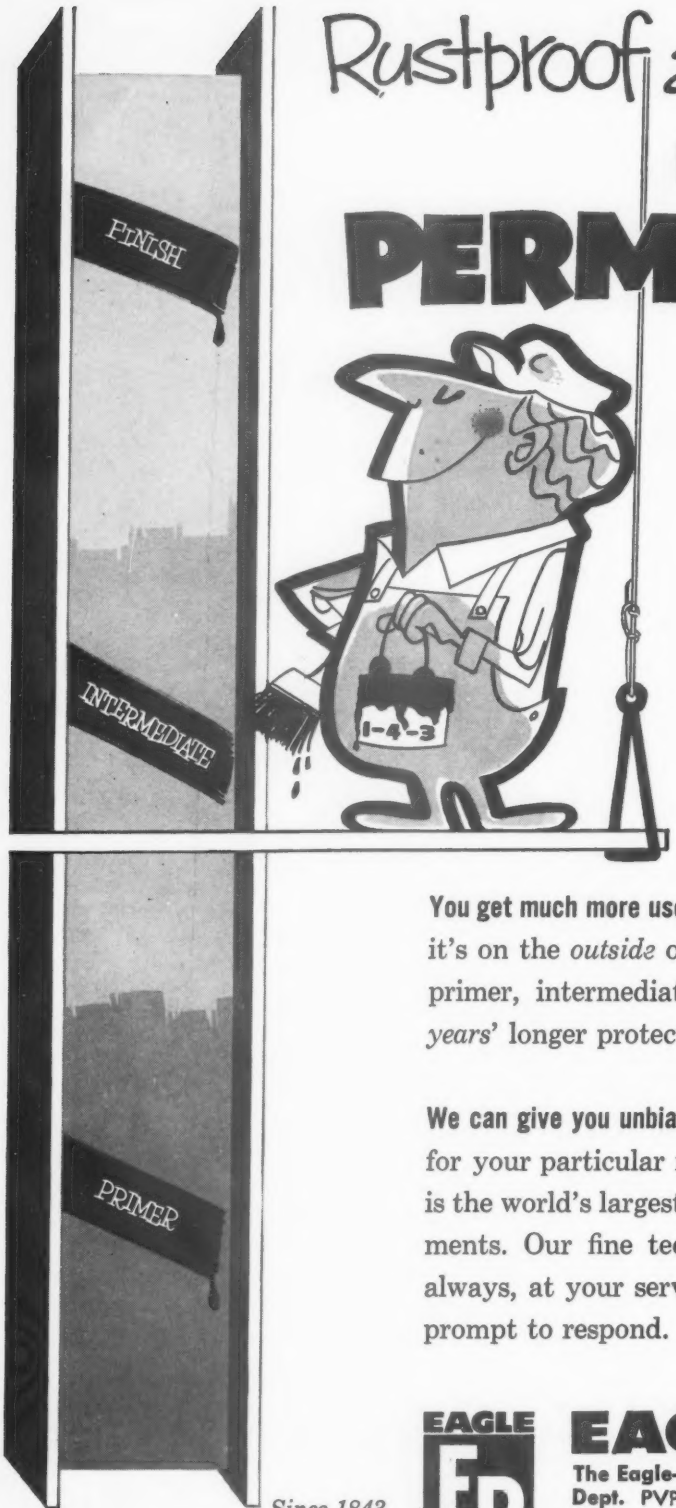
CELITE* diatomite pigments bring three important benefits to exterior paints. First, their interlacing structure provides a strong film reinforcement to help retain tints and resist chalking. Second, these irregularly shaped particles diffuse light and create a soft, uniform flatness. Third, their high porosity permits paint films to breathe, helps resist blistering and peeling.

Find out how Celite can help you improve your exterior paint formulations. Write for further information to Johns-Manville, Box 14, New York 16, N. Y. In Canada, Port Credit, Ontario.

*Celite is Johns-Manville's registered trade mark for its diatomaceous silica products.

JM PRODUCTS

Johns-Manville CELITE Diatomite Pigments



Rustproof all 3 coats with...

EAGLE-PICHER

PERMOX 1-4-3

ONE-FOR-THREE

(Basic Lead Silico Chromate)

One-for-three ... *One* protective pigment *for* all *three* coats of paint. That's Permox 1-4-3. It protects metal surfaces against rust and corrosion and retains colors almost indefinitely.

You get much more use per pound of lead chromate, because it's on the *outside* of the particle. Put Permox 1-4-3 in primer, intermediate and finish coats and you'll get *years'* longer protection.

We can give you unbiased counsel on the best formulations for your particular needs. That's because Eagle-Picher is the world's largest producer of *both* lead and zinc pigments. Our fine technical and research staffs are, as always, at your service. We welcome inquiries and are prompt to respond.

Since 1843

EAGLE EP PICHER

EAGLE-PICHER

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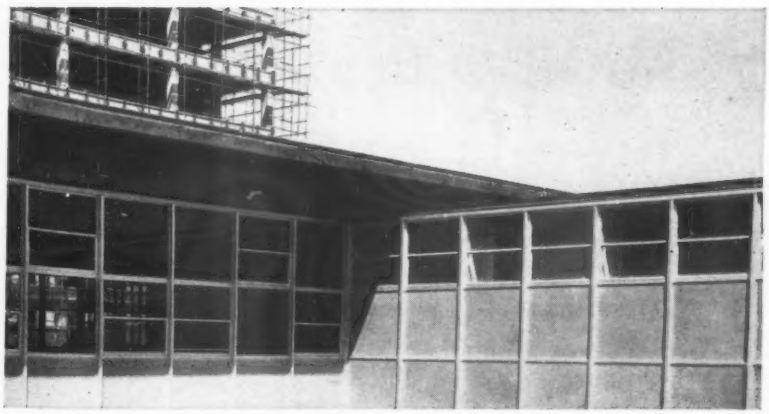
Regional Sales Offices: Atlanta, Chicago, Cleveland, Dallas, Kansas City, New York, Philadelphia, Pittsburgh.

West Coast Sales Agent, THE BUNKER HILL COMPANY, Chemical Products Division
Seattle • Portland • Oakland • San Francisco • Los Angeles • Kellogg, Idaho

Engineering laboratories at the new Convair (Astronautics) plant, San Diego. All exterior aluminum is protected against atmospheric staining and oxidation with a clear, colorless coating of Butyrate lacquer.

WEATHER-RESISTANT BUTYRATE LACQUERS PRESERVE THE NATURAL BEAUTY OF ALUMINUM



Butyrate lacquer, applied immediately after fabrication, protects the aluminum-framed sections, manufactured by Metalco, Inc., of Emeryville, California, from mortar staining and abrasion during erection and from weathering afterward.

Factory-applied coatings of Butyrate lacquer provide long term protection for outdoor aluminum.

Clear and colorless, Butyrate lacquers won't yellow, even under prolonged exposure to sunlight. They withstand oxidation and discoloring...have high strength and flexibility...and are little affected by salt spray or temperature change.

Aluminum surfaces, when protected with Butyrate lacquers, require little in the way of cleaning and maintenance. Usually, the action of rain alone will keep the finish clean and attractive.

This combination of features plus resistance to mortar and plaster staining makes Butyrate lacquers especially advantageous for use on outdoor architectural aluminum...siding, spandrels, curtain walls.

Take advantage of the increasing demand for weather-resistant coatings for exterior aluminum surfaces by offering lacquers made from tough, durable Eastman Half-Second Butyrate.

An informative 15-minute, 16mm. sound color film has been produced especially for viewing by those interested in this market. Would you like to see it? See below.

LACQUER FORMULATORS!

Take these steps to get the complete story on Half-Second Butyrate coatings for outdoor aluminum...their formulation and use.

1. Send for Eastman's catalog on Butyrate lacquers for aluminum. It tells you how these lacquers are effectively preserving architectural aluminum surfaces in all sections of the country.

2. Send for 16mm. sound color film. Please list the dates you plan to show the film and an alternate date.

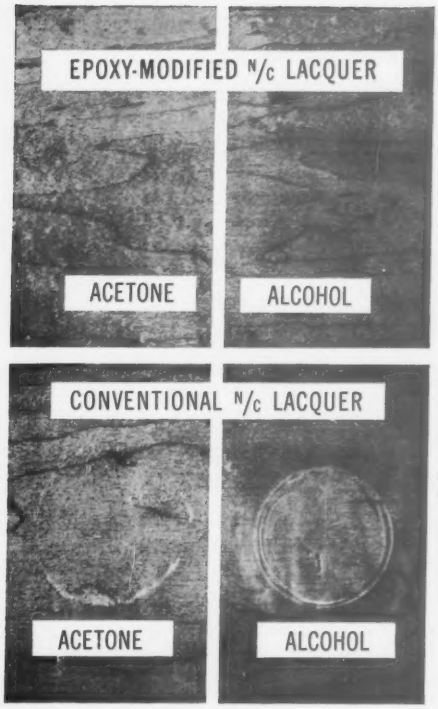
3. Send for "Formulator's Notes," a bound compilation of laboratory reports containing detailed information on suggested formulations and procedures.

The finest lacquers for aluminum are made with

HALF SECOND BUTYRATE

an Eastman film former

SALES OFFICES: Eastman Chemical Products, Inc., Kingsport, Tenn.; Atlanta; Chicago; Cincinnati; Cleveland; Detroit; Framingham, Mass.; Greensboro, N. C.; Houston; New York; St. Louis. **West Coast: Wilson Meyer Co.,** San Francisco; Los Angeles; Portland; Salt Lake City; Seattle.

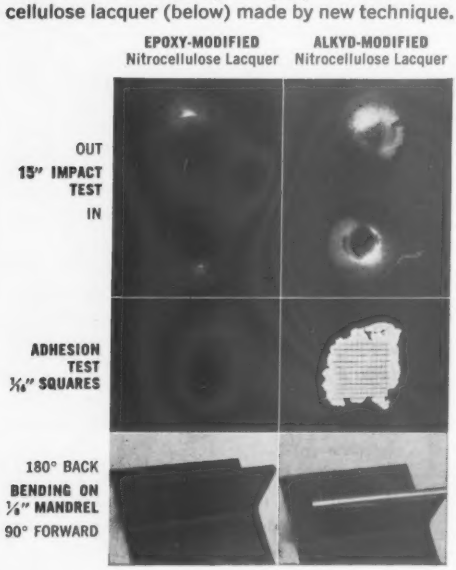


These panels, subjected to identical treatment, show the resistance of epoxy-modified nitrocellulose lacquer to spills of alcohol or acetone (nail polish remover).

Du Pont shows you how to give nitrocellulose lacquers 9 lives

by adding the chemical resistance of epoxies

On Unprimed Aluminum, tests show the superior adhesion and durability of epoxy-modified nitrocellulose lacquer (below) made by new technique.



Lacquers with excellent solvent and chemical resistance . . . tough, durable lacquers easy to rub and repair . . . lacquers with deep gloss and lasting color are now being prepared by adding epoxidized oil and urea formaldehyde resin to nitrocellulose formulations.

You can produce pigmented as well as clear lacquers which can be used to brush, spray, or dip woods and even unprimed metals.

The opportunities presented by this development are large. The information you need to make a decision about your own lacquers has been put into two bulletins by our Sales Development Laboratory. For copies, write to Du Pont Explosives Department, Wilmington, Delaware.

DU PONT NITROCELLULOSE

REG. U.S. PAT. OFF.

Better Things for Better Living . . . *through Chemistry*

DOW | **VINYLTOLUENE**

more compatible raw materials mean more profits

Higher gloss for your paints and varnishes

with Dow Vinyltoluene

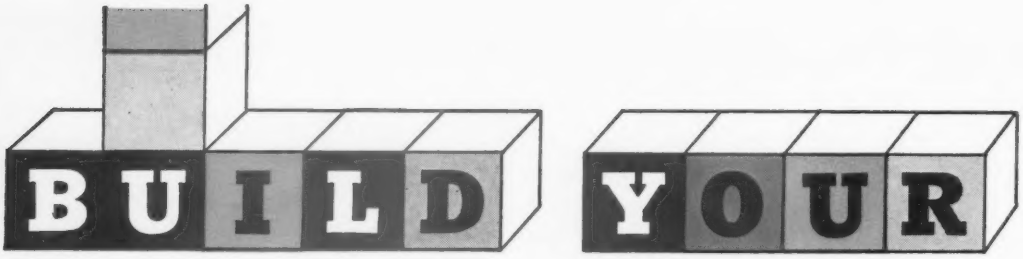
To assure long-lasting high gloss in your paints and varnishes, use Dow Vinyltoluene as the modifier.

Here is a modern modification that forms clear, useful vehicles with any of the commercially important drying oils . . . safflower, tall, linseed, soya or dehydrated castor oil. Dow Vinyltoluene also delivers snap dry, low color, easier application, better adhesion, greater permanence . . . *plus* significant economies!

You'll find Dow Vinyltoluene has its own unique ability to upgrade drying oils and produce paints and varnishes with improved appearance and performance characteristics . . . at lower cost.

Technical details are available from your nearest Dow sales office. Or write to THE DOW CHEMICAL COMPANY, Midland, Michigan, Coatings Sales Dept. 2364DL9.

THE DOW CHEMICAL COMPANY • MIDLAND, MICHIGAN



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- **BENZIDINES**
- **DINITRO-ORANGE**
- **PIGMENT-GREEN-B**
- **ORGANIC REDS, GREENS, BLUES**

Write Technical Service Dept. For Complete Information

OR

Write for Bulletin #32, the new Kentucky Color & Chemical Company's Lead-Free Color Bulletin, containing basic information on lead-free color systems.

Kentucky Color
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The Newfoundland Story

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Annual rainfall at St. John's, the capital, is 53.77 inches. Yet, this doesn't tell the whole story, for the air is damp and foggy most of the time. It's a slow, virtually continual rainfall. A "shower" in Newfoundland may last for two or three days.

As a result of this unusually heavy rainfall, masonry

Photos courtesy Standard Manufacturing Company, Ltd., St. John's, Newfoundland

surfaces were almost impossible to keep looking well. Mildewing was a constant problem. Colors faded. Paint peeled off under the incessant pounding of the weather — and alkali attack from within.

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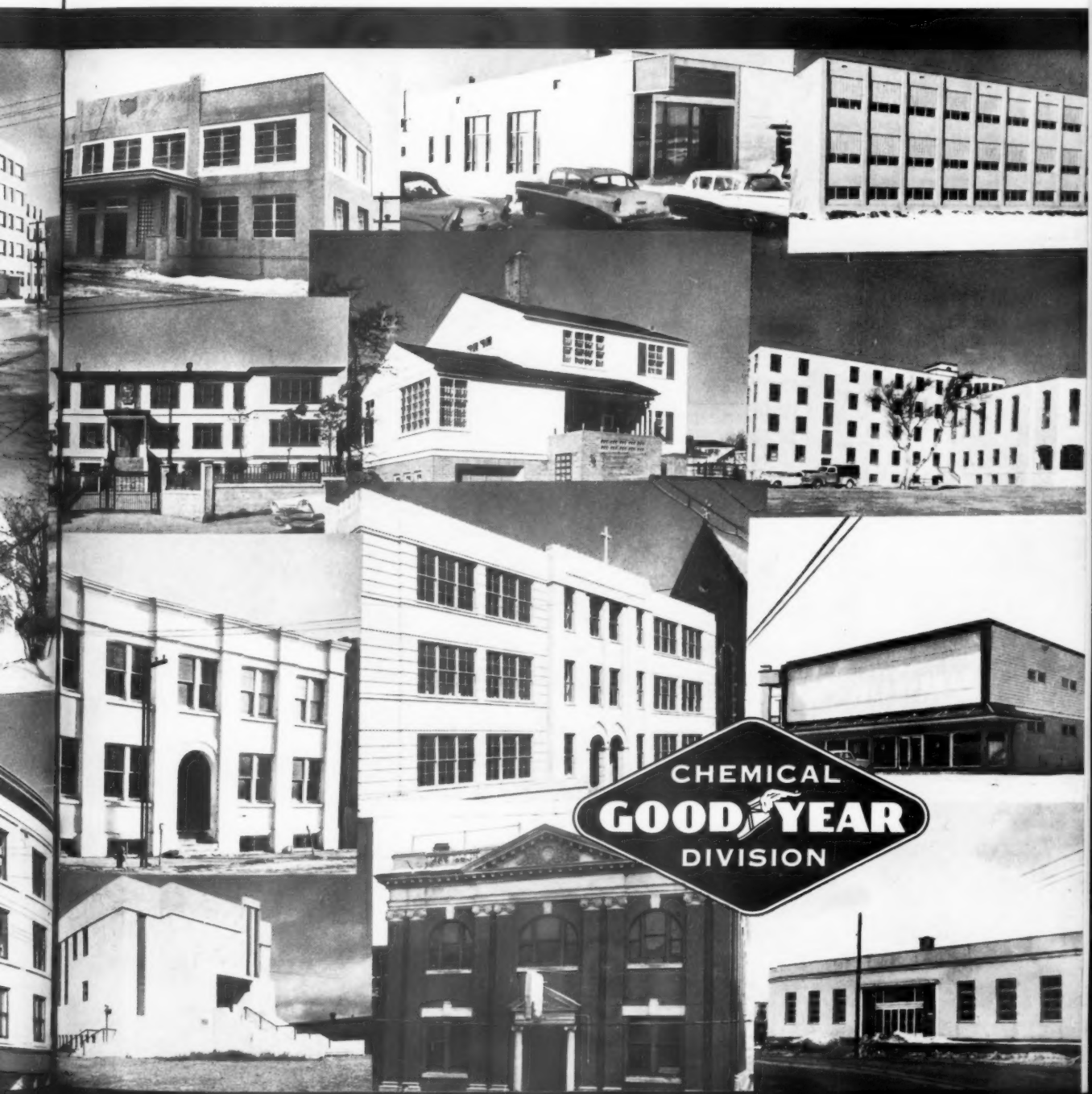

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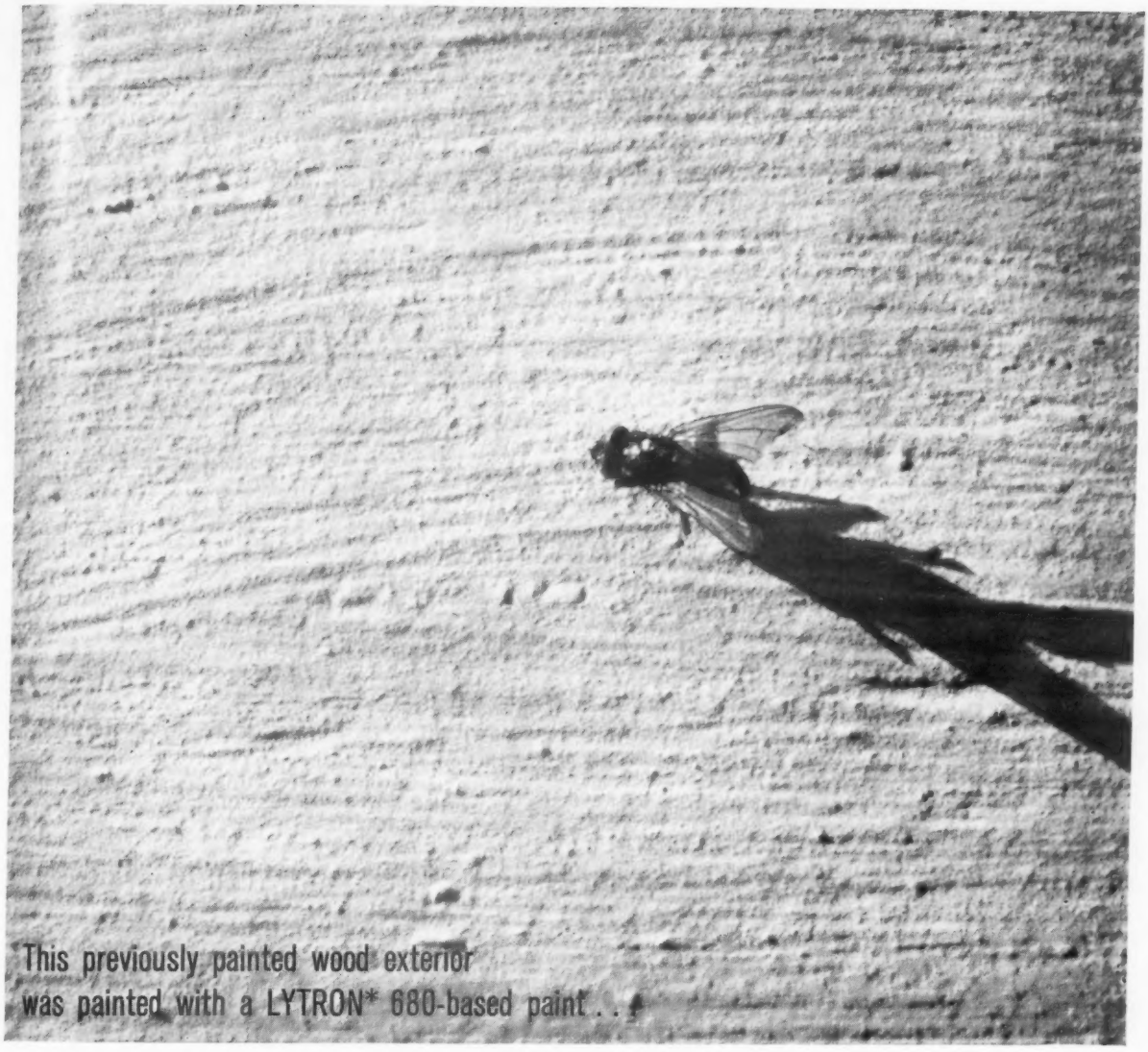

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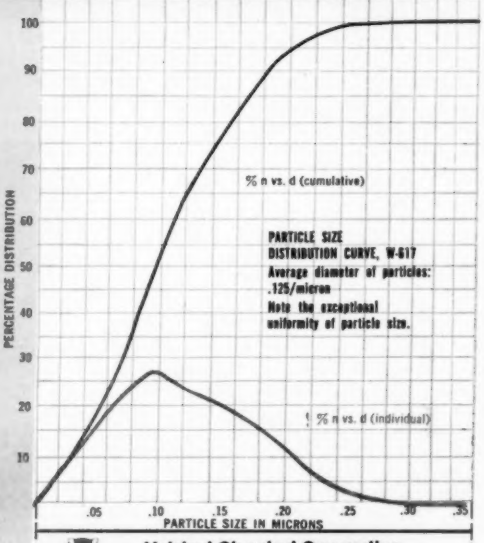

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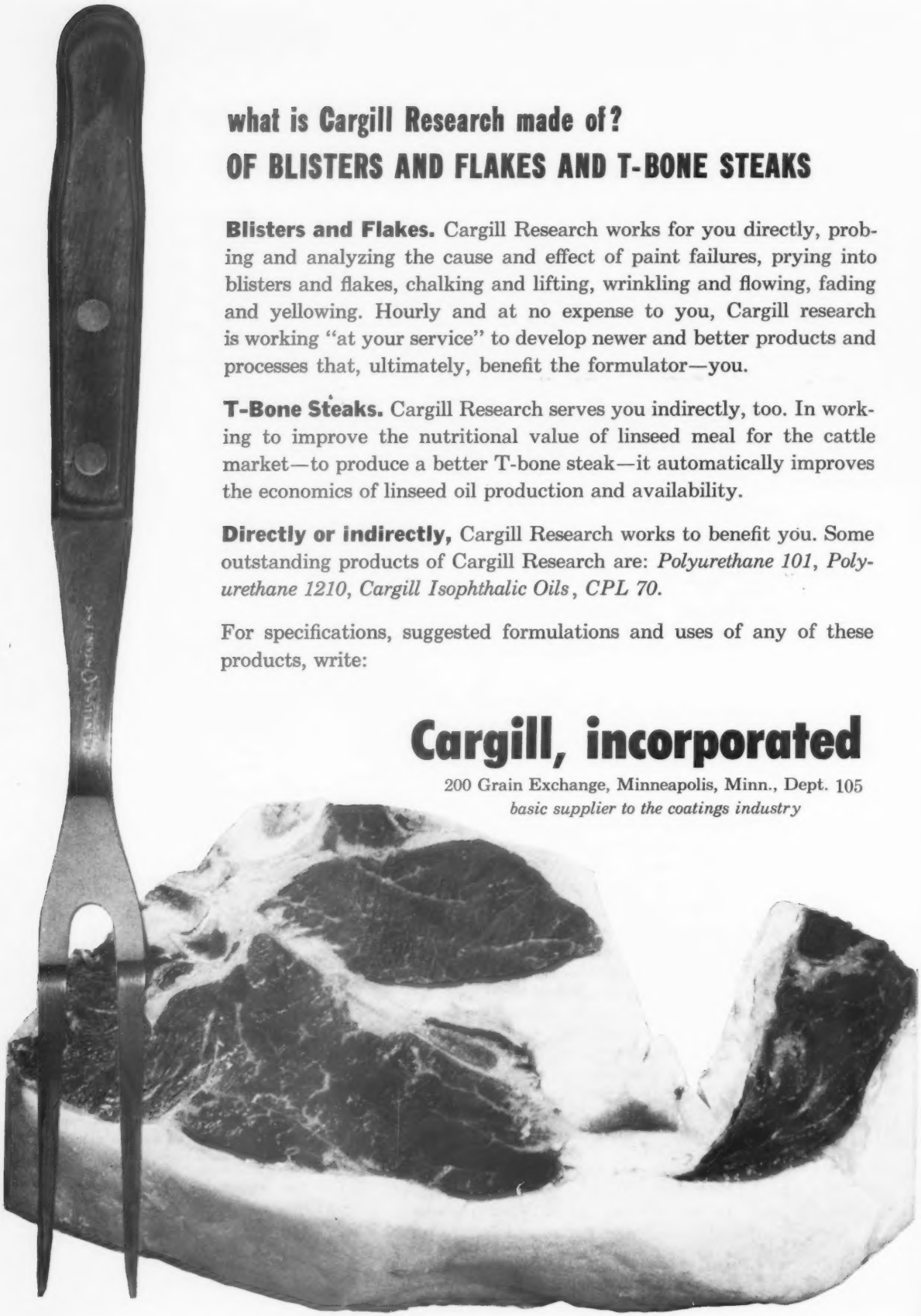

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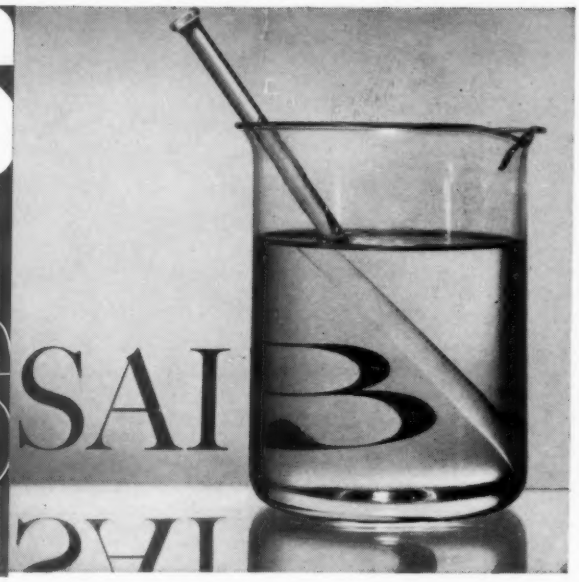

Sucrose Acetate Isobutyrate, new resin modifier-extender, exhibits low color *and* excellent color stability

Sucrose Acetate IsoButyrate (SAIB) is an unusual compound of immediate interest to all who are concerned with the formulation or performance of protective coatings.

Consider these characteristics:

Its color and clarity are a sparkling water-white.

Its color stability on exposure to ultraviolet light is excellent.

Its color stability on prolonged heating is excellent. Example: samples heat-aged 6 days @ 350°F showed only a 9 Gardner color change, from 1 to 10.

Its color stability in the presence of other lacquer ingredients is excellent. Example: in metallic pigmented lacquers, SAIB does not produce a "greening" effect with bronze powder.

Lacquer film formers may be highly modified with SAIB and still show unusually good film tensile properties and hardness. The low solution viscosity of SAIB permits formulation of high-solids lacquers at application viscosities. Higher non-volatile content results in greater coverage per gallon of lacquer and reduced solvent requirements. Formulas are often simplified, too, through replacement of several lacquer-modifying components with SAIB. Film adhesion and permanence is improved in many cases.

To see how easy SAIB is to use, and how little it affects film properties while significantly increasing solids content, simply add it to your present lacquer—try 5 to 10% by volume of total lacquer to start with—spray it, and observe the result.

SAIB has been evaluated in standard formulations for melt coatings, for wood lacquers, paper coatings, cloth coatings, metal lacquers and lacquers for plastics.

For example, nitrocellulose *wood lacquers* containing SAIB show an unusually high film hardness, even at high modification. In Half-Second Butyrate coatings its presence gives an unique visual depth of finish. In *paper coatings*, its use results in very high gloss and good adhesion. In *cloth coatings*, abrasion resistance and appearance are improved. The freedom of color of SAIB is often a distinct advantage in formulating *lacquers for plastics*. In *vinyl and acrylic solutions*, replacement of part of the film former with SAIB improves sprayability and decreases cobwebbing. In *hot melt coatings*, SAIB greatly extends the basic film former.

Few commercial compounds so high in molecular weight display so compact a structure. The outstanding stability of SAIB is attributed to this dense molecular configuration.

Another unusual property of SAIB is its extremely high viscosity at room temperature and sharp decrease in viscosity with addition of heat or solvents. At 30°C, its viscosity is about 100,000 centipoises. At 100°C, the viscosity drops to 90 centipoises. A 90% solution of SAIB in Tecsol®, Eastman proprietary ethyl alcohol, exhibits a viscosity of only 750 centipoises at 30°C.

For handling convenience, SAIB is sold both as a 90% low-viscosity solution, designated *SAIB-90*, and in the 100% unmodified form, designated *SAIB*.

Many other coatings applications for SAIB are being investigated by our Customer Service Laboratories. May we help you evaluate this unique material? For this service or for a sample of SAIB, write to Chemical Sales Development Department, Chemicals Division, Eastman Chemical Products, Inc., Kingsport, Tennessee.

SAIB

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PASSING INSPECTION—Production Manager Harry Back, Development Manager Ed Oeffinger, and Plant Manager Phil Adams inspect panel rolling along to application of first lacquer top coat. These men spent two years designing the plant. Key to its operation is its system of four-foot, motor-driven roller coaters. Replacing time-honored hand-spraying methods, these rollers apply toner filler and nitrocellulose lacquer top coats to each panel as it passes underneath on the conveying belt.

LACQUER—STILL AS MODERN AS THE MOST PROGRESSIVE PRODUCTION LINE

Lacquer is the finish specified for pre-finished production at the United States Plywood Corporation's Orangeburg, S.C., plant. Development Manager Ed Oeffinger feels it is the best possible finish for wall paneling that's manufactured there. It gives greater clarity than other types of finishes and also greater scope in the colors and shadings that can be obtained on natural wood.

From a production standpoint, lacquer means shorter drying schedules and very easy and quick touch up, characteristics other finishes currently employed do not enjoy.

Because of a rollcoat system invented by United States Plywood, virtually every drop of lacquer that goes into Orangeburg finds its way onto the surface of a beautiful Weldwood panel and none is wasted.

Lacquer meets the rigid standards set up by United States Plywood and as Mr. Oeffinger points out, these panels are finished with the same type of lacquer as used by manufacturers of high grade furniture.

Cellulose Products Department

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MINERAL PIGMENTS CORP.

Muirkirk, Maryland

LEAF STABILIZATION OF ALUMINUM PAINTS

By
Rolf Rolles*

The leafing properties of aluminum flake pigment are discussed and are related to an oleophobic stearic acid film held at the flake surface. The mechanism of leafing and deleafing is explained. The effect of organic mono and dibasic acids on leaf stability is reviewed. Leaf stabilization in highly acidic paint vehicles and the durability of paint system containing Alcoa Stabilizer No. 5 are discussed.

During ball milling of aluminum pigment, the aluminum charge is disintegrated and foiled out until the desired particle size and particle size distribution is reached. In the production of leafing aluminum flake pigment, stearic acid is used as the milling lubricant. During this milling process the stearic acid in solution in the milling vehicle, which in almost every case is some type of aliphatic hydrocarbon, is sorbed on the flake surface in a rod-like fashion. Because of the preferred orientation of the fatty acid, close packing is permitted which leaves a monomolecular layer of acid on the flake surface as a result of the affinity of the aluminum surface for the carboxyl group. Because of the close packing of stearic acid molecules, each methylene group within the aliphatic chain has a highly localized field of force attracting it to the methylene group in the adjacent fatty acid molecule; hence, the molecules will cohere to each other. This fatty film which surrounds each particle has some unique properties insofar as it is hydrophobic as well as oleophobic. Essentially, oleophobic films behave against oil and weak polar hydrocarbons as hydrophobic films behave against water; that is, the film is not easily wetted by those compounds.

*Alcoa Research Laboratories, Aluminum Co. of America

This paper was presented before the April Meeting of the Technical Committee of the New York Paint and Varnish Production Club.

Discussion of Leafing

The properties and the behavior of oleophobic films have been investigated extensively by Bigelow and co-workers[1] who have measured contact angles of various organic solvents on oriented stearic acid films. Without going too deeply into the physical behavior of these films, it can be said that the leafing properties of aluminum flake pigment are attributed to this fatty film. Depending upon the degree of wetting by the vehicle of the aluminum flake surface, more or less leafing will take place. In general, a nonwetted flake will leaf or float better than a wetted flake. The leafing process of flake metal pigments may be explained as follows.

After applications of the paint, solvent from within the paint film evaporates and establishes a motion in the film operative from the substrate toward the air interface of that film. Gravitational effects are overcome by the evaporation forces insofar that pigments having three to four times the specific gravity of the vehicle undergo the same motion, as Bartell and Van Loo[2] have shown by pigmenting varnishes with various inorganic and organic pigments.

The speed with which the aluminum flakes will travel through the paint film depends largely on their colligative properties, the evaporation rate of the volatile solvent, and the viscosity of the paint. These vertical convection currents are usually shown as a hexagonal cell formations as described by Benard.[3]

Figure 1 shows a photograph of an aluminum paint film in which the cell formation is clearly indicated.** Once the particles are in the upper surface layer of the

**Photograph courtesy of M. Van Loo, The Sherwin-Williams Co.

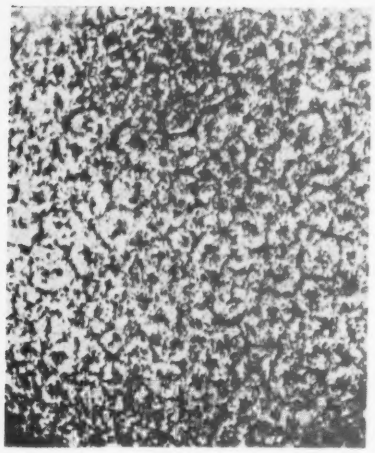


Figure 1. Cell formation caused by evaporation forces.

paint film they will remain there because of the high interfacial tension between the pigment surface and the vehicle. As more and more solvent evaporates, the film becomes somewhat immobile, leaving a semicontinuous layer of flake pigment near the surface of that film. After drying, a bright aluminum paint surface is achieved having a reflectivity of 65 to 75 per cent as compared to nonleafing aluminum pigment films which usually have reflectivities of 40 to 50 per cent. Leafing of aluminum flakes will take place only while the stearic acid film is present and oriented at the flake surface, and while the pigment is dispersed in a medium which more or less promotes the leafing property. In many instances, however, this fatty acid film is not permanent. Since the film only consists of a relatively soft, sorbed compound, the destruction of that film can come about by either mechanical or chemical means, the latter being the one with which we are concerned in this discussion.

Effect of Acids

It is well-known, for example, that organic acids, alcohols, and amines, if present in sufficient quantity in a vehicle, will destroy the leafing properties of the metal flake pigment. In acidic vehicles, for example, the leaf stability of a ready-mixed leafing aluminum paint depends largely on the type and concentration of acid present in the vehicle.[4]

The effect of organic acids on leaf and leaf stability has been investigated extensively, and it has been found that with aliphatic acids the leaf was affected to a degree corresponding inversely to the chain length of the acid; that is, with increasing chain length, less effect on leaf stability was noticed. For a given concentration of acid, for example, propionic acid was found to destroy leaf faster than heptanoic acid; but then in turn, heptanoic acid destroys leaf faster than nonanoic acid. The same trend is found in aliphatic dibasic acids.

To cite just a few examples in the monobasic acid series, propionic acid, if present in aluminum paint at an acid number of 5 after one week's time, completely destroyed leaf, whereas a paint containing octanoic acid at the same acid number did not lose leaf appreciably in the same length of time. In the aliphatic dibasic acid series, at an acid number of 5, an aluminum paint containing oxalic acid showed no leaf after one day's storage, whereas a paint containing adipic acid showed an 80 per cent spatula leaf after the same time of storage.

Tests were run on nearly all commonly used organic acids at acid numbers of 5, 10, and 15, and it was found that, in all cases, leaf retention at an acid number of 10 was poorer than at an acid number of 5. These findings indicate that the strength of the acid as well as the concentration are factors to consider in the speed of deleafing. If the strength of acid is expressed as the dissociation constant of the acid, a relationship between dissociation constant and speed of deleafing is observed.

Figure 2 shows a graphical comparison of this relation. In this graph, both mono- and dibasic acids at an acid number of 5 are compared to the one-day leaf retention. In all cases, the dissociation constant of the first hydrogen has been used independent of whether it was in a mono- or dibasic acid. The destruction of leaf in aluminum paints containing excess organic acids is fairly well understood. As discussed earlier, the stearic acid acid film consists essentially of a monolayer which is held at the surface by secondary forces. In the presence of acids which have a greater activity, the stearic acid film is essentially replaced by the acid in the vehicle. If this takes place, the surface characteristics of the flake pigment are changed to the degree that wetting of that surface by the vehicle is permitted. As soon as sufficient wetting takes place, the pigment in that vehicle will cease to leaf.

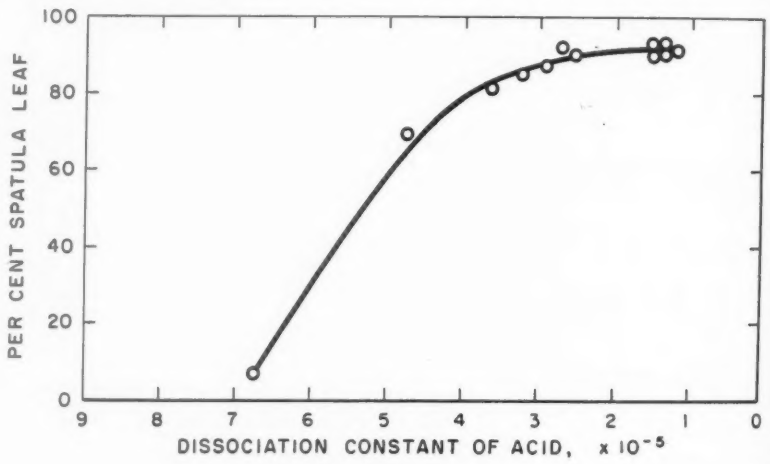


Figure 2.

With the help of infrared spectroscopy, extracts of aluminum flake pigments which had been deleafed in contact with high acid number alkyds have been investigated, and it was found that the tightly held surface film on the flake changed considerably in composition after deleafing. Figure 3 shows the spectrum of a residual film after deleafing. The wide line curve shows the spectrum of the extract, whereas the thin line shows the spectrum of the alkyd in which the pigment was dispersed. By comparing the two spectra it

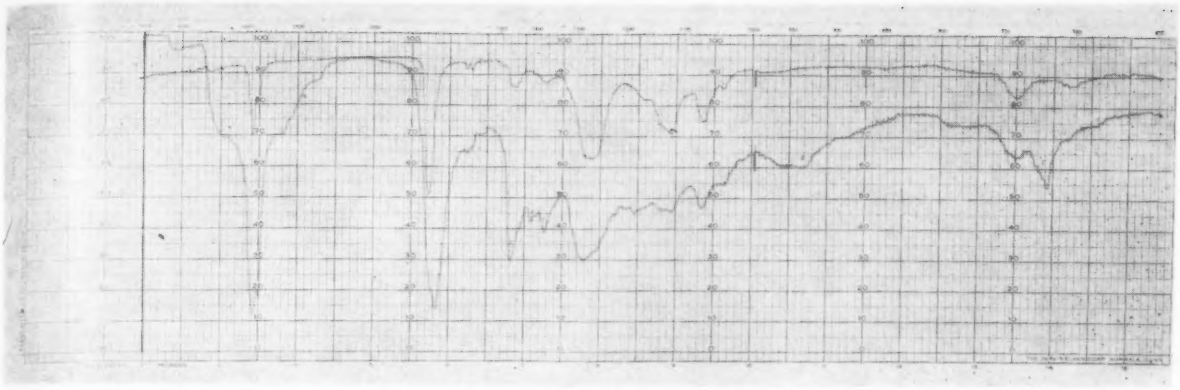


Figure 3.

can easily be seen that similarities exist insofar as all bands found in the alkyd spectrum are also found in the spectrum of the extract, although is some cases they may appear as shoulders. Quantitatively, it was found that the extract contains approximately 41 per cent alkyd and 59 per cent stearic acid.

Effect of Vehicle Acidity

The above discussion obviously defines why, in the past, ready-mixed aluminum paints were mostly prepared with medium to long oil varnishes containing a comparatively neutral resin. Very few alkyds were used, since leaf stability of those paints was poor.

Alkyd resin specifications for some alkyd aluminum paints specified low viscosities and acid numbers, the latter being in the range of 3 to 5. These requirements are sometimes hard to meet especially in medium oil alkyds. Because of this, alkyd resin vehicles were used only to make freshly mixed aluminum paint. The paint is usually prepared on the job by mixing aluminum paste or powder with the vehicle just before use. The danger of deleafing is reduced, since the paint is consumed immediately; however, the factor of human error in measurements and personal prejudice as to what the paint should contain, as judged by the individual painter, was introduced.

Leaf Stabilization of Vehicle

Approximately three years ago, the task of trying to stabilize alkyd resins against loss of leaf was undertaken. It was generally felt that the best approach would be to stabilize the resin rather than the pigment, since in the case of vehicle stabilization, each and every grade of aluminum pigment available could be used. This, obviously, would eliminate increased warehousing and a complete new line of aluminum pigments.

While investigating compounds which could be combined with the alkyd resins to stabilize them against loss of leaf, it was found that certain groups of chemicals, when mixed in given proportions with the vehicle, would permit the preparation of ready-mixed alkyd aluminum paints with good leaf stability. This investigation led to the development of Alcoa Stabilizer No. 5, which is under discussion in this paper. In order to investigate the effectiveness of this additive, some tailor-made alkyd resins and varnishes were prepared at Alcoa Research Laboratories. All vehicles investigated titrated to acid numbers in the range of 14 to 18 which, incidentally, is abnormally high. From these vehicles,

Alkyd or Varnish	Acid No.	% Phthalic Anhydride	% Oil	Type Vehicle	Leaf Stabilizer	Initial leaf	% Leaf of Initial 1 mo.	3 mos.	6 mos.	12 mos.	19 mos.
Alkyd No. 23	16	36	52	Medium Alkyd	Yes	55	100	100	56	53	18
Alkyd No. 23	16	36	52	" "	No	36	0	0	0	0	0
Alkyd No. 5	16.6	36	52	" "	Yes	62	100	100	100	100	100
Alkyd No. 5	16.6	36	52	" "	No	41	0	0	0	0	0
Varnish No. 1	17.6	0	50	Cooked 8 gal. Penta Resin	Yes	77	100	100	100	100	100
Varnish No. 1	17.6	0	50	"	No	88	90	74	21	0	0
Varnish No. 2	14.3	0	50	Cooked 8 gal. Mod. Phenolic	Yes	77	100	100	100	100	90
Varnish No. 2	14.3	0	50	"	No	82	100	97	58	35	0
Varnish No. 3	17.6	0	50	Cold Cut 8 gal. Penta Resin	Yes	77	100	100	100	100	82
Varnish No. 3	17.6	0	50	"	No	87	90	83	17	0	0
Varnish No. 4	14.3	0	50	Cold Cut 8 gal. Mod. Phenolic	Yes	79	100	95	100	100	98
Varnish No. 4	14.3	0	50	"	No	87	42	0	0	0	0

Table I. Effect of leaf stabilizer on leafing of aluminum paints in various vehicles.

Type Alkyd	% Phthalic Anhydride	% Oil	Acid No.	Leaf Stabilizer	Initial Leaf	% Leaf of Initial 1 mo.	2 mos.	3 mos.	4 mos.	5 mos.	6 mos.
Long	24	65	3.85	Yes	73	97	97	95	95	95	95
"	24	65	3.85	No	78	95	95	89	89	82	85
"	24	65	4.90	Yes	75	100	96	96	100	95	100
"	24	65	4.90	No	83	86	88	88	89	88	81
"	24	65	6.70	Yes	72	100	100	100	100	96	100
"	24	65	6.70	No	81	98	93	93	90	88	80
"	24	65	8.30	Yes	75	100	91	91	84	70	60
"	24	65	8.30	No	79	37	0	0	0	0	0
Medium	33	56	5.60	Yes	75	97	97	97	97	97	97
"	33	56	5.60	No	81	95	95	94	87	82	82
"	33	56	8.90	Yes	76	93	92	91	91	86	90
"	33	56	8.90	No	81	92	92	87	78	63	50
"	33	56	12.6	Yes	76	100	91	91	87	90	88
"	33	56	12.6	No	79	90	88	75	58	0	0
"	33	56	16.6*	Yes	76	89	88	90	84	75	75
"	33	56	16.6	No	84	0	0	0	0	0	0
Medium Short	35	52	7.60	Yes	73	86	86	86	83	83	90
"	35	52	7.60	No	70	99	88	83	68	57	49
"	35	52	15.20	Yes	66	91	89	82	83	80	80
"	35	52	15.20	No	78	54	0	0	0	0	0
"	35	52	21.0	Yes	53	64	50	45	30	15	10
"	35	35	21.0	No	65	0	0	0	0	0	0

Table II. Effect of leaf stabilizer on leafing of aluminum paints in commercial alkyd vehicles.

ready-mixed aluminum paints were made using Alcoa Paste pigment No. 209 at pigmentation equivalent to two pounds per gallon at 50 per cent resin solids. The paints were tested with and without Stabilizer No. 5 so that the leaf results were in direct comparison. Table I shows the differences obtained in a 19-month leaf stability test. In all cases, it was found that the addition of the stabilizer was beneficial to leaf.

After 12 months leaf stability data were obtained on the above paints, commercial long and medium oil alkyds were then investigated to insure the commercial feasibility of Alcoa Stabilizer No. 5. Three alkyd resins were selected for this investigation. These were a long oil alkyd meeting Federal Specification TT-R-266a, Type I; a medium oil alkyd meeting Type III of the same specification; and a slightly shorter oil alkyd having a 35 per cent phthalic anhydride content.

Several samples of each resin having different acid numbers were obtained. In the case of the long oil alkyd, resins having acid numbers from 3.8 to 8.3 based on resin solids were investigated. The medium oil alkyd resin was obtained with acid numbers from 5.6 to 16.6, and the 35 per cent phthalic anhydride content resin varied in acid number from 7.6 to 21.0. All vehicles were reduced to 40 per cent resin solids and a portion of each vehicle was treated with Alcoa Stabilizer No. 5. After pigmentation, cobalt and zirconium driers were added and the treated paints along with paints containing no stabilizer were tested for leaf stability over a period of six months. Table II shows leaf stability of these aluminum paints. Again, in all cases where the stabilizer was present, better leaf stability was obtained. Here again, the stabilized vehicles were superior in leaf stability.

Added Effects of Leaf Stabilizer

Along with leaf stability, all paints containing commercial alkyd resins were exposed to salt spray, alternate immersion in salt water, and weather exposure. In all cases, steel panels were solvent cleaned and the paint was applied by spraying on unprimed panels.

Figures 4, 5, and 6 compare stabilized aluminum paints against the blanks in a 50-hour A.S.T.M. salt spray test. In almost all cases, resistance to rusting in salt spray was improved by employing Stabilizer No. 5 in the paint formulation. In the salt spray test, one reversal was found and that was a paint made with the medium oil alkyd at an acid number of 13. In this case, the blank actually showed less corrosion than the treated vehicle. No explanation for this reversal can be offered at this time.

A comparison of stabilized and unstabilized paints in alternate immersion in salt water is shown in Figure 7. The resin used in this paint formulation met Federal Specification TT-R-266a, Type I. The paint contained two pounds per gallon Alcoa Paste No. 209, based on 50 per cent resin solids. After seven days' air drying, the panels were exposed in our outdoor alternate immersion tank for five consecutive days. This type exposure is comparable to East Coast tidewater exposure. These panels showed the same trend as was found in the salt spray test; that is, the paints containing

Figure 4.

Upper Row: Stabilized Lower Row: Unstabilized
Alkyd aluminum paint with resin meeting Federal Specification TT-R-266a,
Type III. 50 hours A. S. T. M. salt spray.

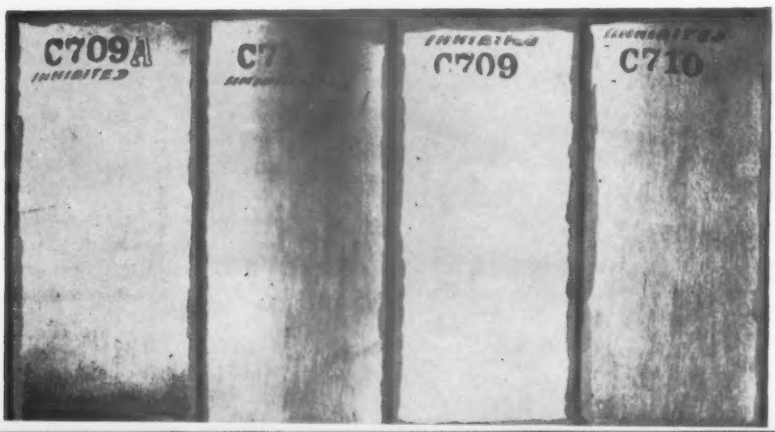
Figure 5.

Upper Row: Stabilized Lower Row: Unstabilized
Alkyd aluminum paint with resin meeting Federal Specification TT-R-266a,
Type I. 50 hours A. S. T. M. salt spray.

Figure 6.

Upper Row: Stabilized Lower Row: Unstabilized
Alkyd aluminum paint containing resin with 35% phthalic anhydride. 50 hours A. S. T. M. salt spray.

Figure 7. Condition of aluminum painted steel panels after five days in outdoor alternate immersion tank. Shown are front of panels, 0.3 mil dry film thickness. Alkyd resin acid no. 6, 65% soya oil.



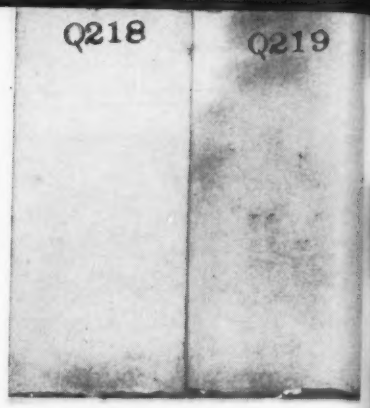


Figure 8. Left: With leaf stabilizer. Right: Without leaf stabilizer. Alkyd aluminum paint with resin meeting Federal Specification TT-R-266a, Type III, 18 months exposure at New Kensington, Pa. No primer. Top coat 0.7 mil thick.

stabilizer performed better than the controls. Exterior exposure on the roof of Alcoa Research Laboratories in New Kensington also indicates that the durability of alkyd aluminum paint is improved when stabilizer is used.

Figure 8 compares the durability of one coat alkyd aluminum paint with and without additive. This set of panels was exposed for 18 months at 45° to the vertical, facing south. The alkyd resin used in this paint formulation met Federal Specification TT-R-266a, Type III.

Figure 9 compares two paints exposed for 13 months at the same location. These paints were formulated with a resin meeting Type I of the same specification. On both

Figure 9. Left: With leaf stabilizer. Right: Without leaf stabilizer. Alkyd aluminum paint with resin meeting Federal Specification TT-R-266a, Type I, 13 months exposure at New Kensington, Pa. No primer. Top coat 0.5 mil thick.

sets of panels it can be noticed that the paints containing the additive show less corrosion and staining than the control.

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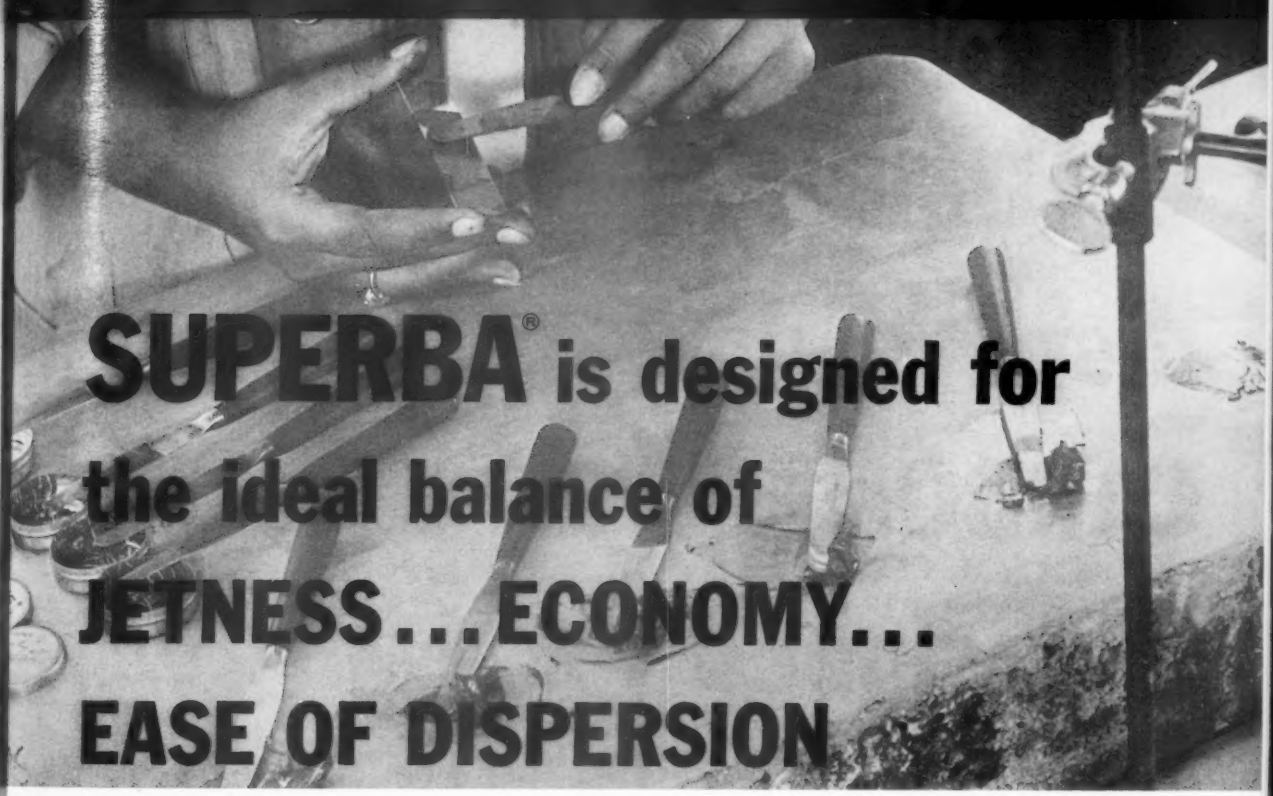

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DEVELOPMENTS in POLYVINYL ACETATE COATINGS

By
Norman G. Tompkins*

A SHORT time ago, I was lucky enough to be in Germany visiting various chemical companies there. At one of them I was told that in October 1958 they had manufactured 10 million pounds of polyvinyl acetate emulsions, a new record for a single month. Further, they told me that forty to fifty per cent of this material was destined for use as a paint vehicle.

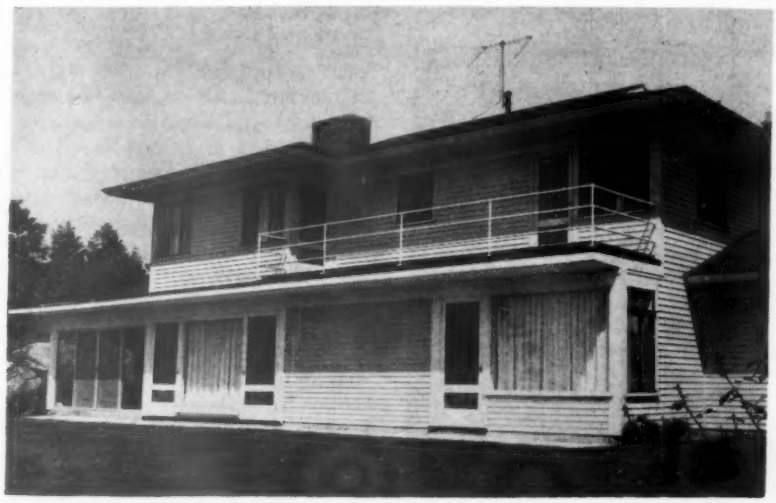
In our own country, it is estimated that 160,000,000 pounds of vinyl acetate polymer and copolymer emulsions are made each year with about the same proportion of the total going into paint. This would mean a yearly production of around 16,000,000 gallons of paint based on these emulsions as vehicles. This is certainly a remarkably high figure when it is remembered that, in the United States, these materials have been used commercially in paints for less than 10 years.

Such wide use and such rapid growth as these figures indicate, are evidences of the many ways in which the properties of the polyvinyl acetates correspond to those of an ideal paint resin. I should make it clear at this point that in the figures above, and in what is to follow, I mean the term "polyvinyl acetates" or "PVA" to include both the homopolymers and the many internally plasticized copolymers whose major component is vinyl acetate.

Properties

Let us review for a moment some of the properties of this versatile group of resins:

1. They are clear and water white in color.
2. They are chemically saturated and therefore have good stability to heat, light and oxygen.
3. They are tough and abrasion resistant.
4. They have excellent adhesion to a wide variety of surfaces.
5. They have very little odor.



Exterior paint based on vinyl acetate copolymer is in good condition after four years of seashore exposure in New England. Two coats were applied over old, slightly chalked oil paint in fair condition.

*Dewey and Almy Chemical Co., Div. of W. R. Grace & Co., Cambridge, Mass.

This paper was presented at the Third Short Course in Paint Technology, University of Florida, February 2-6, 1959.

The oldest vinyl acetate copolymer exposure is this boiler house atop Dewey & Almy's Cambridge, Mass. plant. After six years, asbestos siding is bright and clean, with no serious weathering.

6. Most are made from readily available raw materials by basically simple processes and therefore are low in cost.

Add to these the fact that paints based on the polyvinyl acetates are generally conceded to show better tint retention than those based on many other vehicles and a portion of the reason for their popularity begins to appear.

Although the polymers and copolymers of vinyl acetate are manufactured in many forms, as bulk polymers, as solution polymers or as bead polymers, for example, and although they first made their appearance in paints in the form of solutions in solvent, today, in the paint industry, we are talking almost entirely of emulsions. This is not only because of the well known consumer advantages of water based paint products, but also because a resin in emulsion form can have a higher molecular weight and therefore more toughness and durability without the viscosity becoming excessively high or the solid content impractically low.

Flexible film of internally-plasticized vinyl acetate copolymer, left, developed in 1953, was an impovement over more brittle homopolymer, right.

Uses in Paint

Today, most of the polyvinyl acetate type emulsions which are used in the paint industry are made into exterior masonry finishes, primer sealers for either interior or exterior use, and interior flat wall paints. It has been possible to formulate excellent competitive products in all of these categories and thousands of gallons are sold each day all over the country and in foreign lands as well. Use of the polyvinyl acetates in paint is still growing and, even if no new emulsions were introduced and no new PVA paint formulations discovered, it would probably continue to do so for some time to come. This is because these emulsions are so well adapted to their present uses and because the use of paints in general and water based paints, in particular, still seems to be increasing.

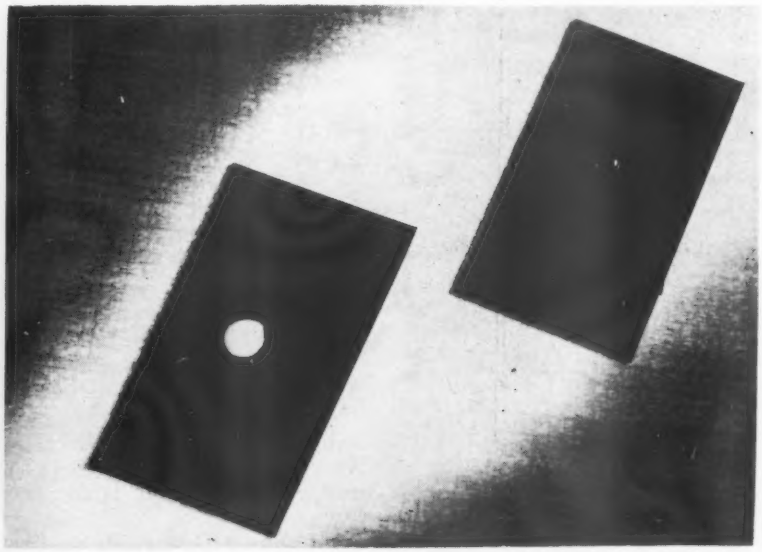
But we should not be satisfied with this. The basic properties of PVA are so excellent for paint that it would be desirable to use it for a much wider group of water base paint applications. Herein lies the need for the developments which are the subject of this paper. Developments which tend to make possible the expanded use of PVA in the paint field are of several kinds:

1. The emulsions themselves may be altered or modified to better suit them for new uses or to solve problems met with in present uses.
2. New paint formulations may be developed which better utilize the advantages of PVA and overcome its deficiencies.
3. Entirely new coating applications may be uncovered for which PVA is particularly well suited.

A necessary prelude to developments in the first category above is recognition of the basic fact that all polyvinyl acetates are not alike. This sounds elementary but we often hear opinions expressed which reflect insufficient appreciation of this axiom. When we are told that polyvinyl acetates are too sensitive to water, to solvents and to heat, and cold, that they have too high a minimum film forming temperature, too large a particle size or that their films contain too much water soluble material, we usually find that our informant has examined only one or two examples and has generalized liberally from them. True, polyvinyl acetates do tend to have these faults. But different emulsions vary greatly both in the extent to which they show these

A special kind of efflorescence occurring in Florida development houses painted immediately after construction is "framing," in which outline of cinder blocks shows through stucco and paint. Promising solutions to problem are being currently field tested.

drawbacks in paint work, as well as in the extent to which they exemplify the inherently good properties of the resin. We have been talking of vinyl acetate homopolymer and copolymer emulsions as if they comprised a very homogeneous group of products in which one member differs from another in only minor aspects. Nothing could be further from the truth. Even in vinyl acetate homopolymer emulsions utilizing the same general type of emulsifying system; say, polyvinyl alcohol, extremely significant variations can be made by varying processing conditions or catalyst, changing the type of polyvinyl alcohol or by the introduction of minor amounts of additives such as crosslinking agents. When the emulsifying and stabilizing system is changed the possibilities are multiplied enormously, and when one or more comonomers are added, they approach the infinite. We have only begun to explore these almost innumerable combinations.

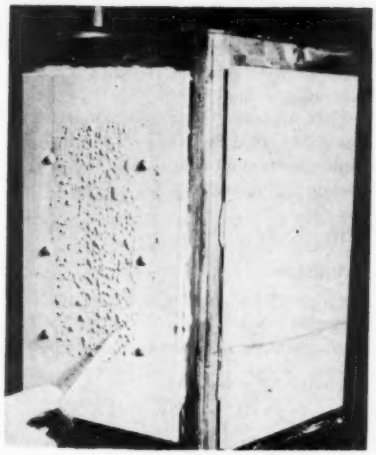


Although vinyl acetate emulsions do have basic water sensitivity, the degree varies widely. Drops of water cloud surface of left panel in two minutes (vinyl acetate homopolymer with plasticizer added). Panel at right shows almost no clouding (vinyl acetate copolymer). Small white spots are light reflections.

New Emulsions

One of the most promising avenues leading toward improved polyvinyl acetate type emulsions is that involving changes in the emulsifying system. In seeking to reduce the water soluble content in the film, or to make dispersions with smaller particles, it is a natural and logical route to take. There has been a great deal of work done along this line and, in my opinion, the most significant developments which have recently emerged as a result have been the microparticle size vinyl acetate polymer and copolymer emulsions. These are completely different from the usual emulsions which depend for their stability on the presence of a protective colloid such as polyvinyl alcohol or hydroxethyl cellulose. Because of the absence of these protective colloids and because of their one-tenth micron particle size and high specific surface, they form well integrated films under a greater variety of conditions, an important consideration for many types of paint work. Basically they are anionic in nature and therefore more compatible with many colored pigment dispersions. Again, their films contain smaller amounts of water-extractable material giving them further advantages as paint vehicles.

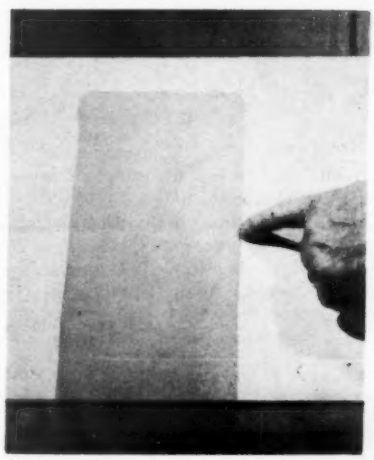
These new emulsions give us new means of attack on many of the problems we occasionally face in applying PVA paints to an ever widening variety of substrates under different application and climatic conditions. In addition, they may help polyvinyl acetate to enter new fields like that of gloss and semi-gloss paints. I have rereviewed below some of the ways in which these new products are helping us remove some of the roadblocks in the way of even greater



"Blister box" test shows dramatically how moisture trapped in substrate causes traditional paint to blister, left, but passes through vinyl film, right, causing no blisters.

usage of PVA in paints. The problems here discussed are not peculiar to PVA paints but are encountered to one degree of another in all types of latex finishes. Nor can they be considered to be completely solved at the present time. There is enough evidence to indicate, however, that in these microparticle size products we have some very useful new tools which are giving us results of great interest and practical significance.

The formation of a well-integrated film on drying under a variety of conditions has presented difficulties in many types of latex paint. Film formation is influenced by temperature, by the characteristics of the resin and by the type and amount of solvent or plasticizer present. It also seems to be affect-



Studies of efflorescence reveal that paint dries much lighter over limed surface (below hand) than on unlimed surface (above hand).

Dispersion	Lbs./100 Gals.	Gals.
Potassium Carbonate	1.0	.05
Non-ionic wetting agent (Igepal CTA-639)	1.5	.17
Water dispersible lecithin	7.0	.81
Carbitol Acetate	20.0	2.42
Phenyl Mercuric Borate	0.2	–
Rutile titanium dioxide	200.0	5.71
Calcium carbonate	140.0	6.20
Clay	110.0	5.07
Water	130.0	15.62
Reduction		
Methocel 65 HG 4000 cps. 3% solution	175.0	21.00
Water	132.0	15.85
Vinyl acetate copolymer emulsion (51% T. S.)	210.0	23.60
Viscosity Adjustment		
Methocel 65 HG 4000 cps. 3% solution and/or water	29.2	3.50
Total Yield	1155.9	100.00

Directions

1. Mix the first nine items in a change can mixer withholding enough water to form a smooth paste.
2. Add the remaining water to the mixer, and pass once through a high speed stone mill.
3. Add the remaining items to the dispersion in the order given, with agitation.
4. Adjust to volume with 3% Methocel solution and/or water as indicated by viscosity.

Physical Constants

Pounds/gallon	11.6
Pigment vol. concentration	61.0%
Total solids	48.25%
Pigment solids	38.9%
Viscosity	80 ± 5 KU
pH	7.5–8.0

Formula A: White interior flat wall paint based on vinyl acetate copolymer emulsion.

Dispersion	Lbs./gals.	Gals.
Non-ionic wetting agent (Nonic 300)	1.5	.17
Non-ionic wetting agent (Daxad 32) (20%)	7.5	.86
Water	200.	24.00
Rutile Titanium dioxide	200.	5.72
Calcium carbonate	256.	11.35
Phenyl mercuric borate	0.2	–
Reduction		
Defoamer	0.5	.07
3% Methocel 65 HG 4000 cps	150.	18.00
Microparticle size vinyl acetate copolymer emulsion (55%)	205.	22.80
Water	52.	6.20
Viscosity Adjustment		
Water and/or Methocel Solution	90.3	10.83
Totals	1163.0 lbs.	100.00 gals.

Directions:

1. Mix the first four items under Cowles dissolver then add the pigments and grind for 10 to 15 minutes.
2. Add the defoamer to the dispersion, agitate slowly for 1 to 3 minutes and then continue let down in order given.
3. Adjust to viscosity with water and/or 3% Methocel solution.

Physical Constants

Pigment volume concentration	59.5%
Total solids	49.
Weight per gallon	11.6
Viscosity	75-80 KU

This formulation consolidates well at temperatures down to 50°F as is, and if 5 to 10 lbs. of Butyl Cellosolve Acetate or Toluol are added, it will consolidate well at 40°F. Freeze-thaw resistance at –20°C may be obtained using 30 to 40 lbs. Ethylene Glycol per 100 gals.

Formula B: Interior flat wall paint based on a microparticle size vinyl acetate copolymer emulsion.

ed by the porosity of the surface and by the presence in it of certain substances such as lime. Lack of good consolidation is evidenced in exterior paints by rapid and non-uniform color changes and poor durability and in interiors chiefly by fading and non-uniformity of color and sheen. In extreme cases, poor holdout may be encountered in primers and poor scrub resistance or wet pigment ruboff in topcoats. Even fine checking is sometimes observed.

Color Non-Uniformity

One of the forms in which this problem appears occasionally is in non-uniformity of color over fresh plaster walls, a problem which has been encountered with all kinds of paints for as long as paints and plaster have been in existence. In our investigation of this problem in relation to vinyl acetate copolymer emulsion paints, we first tried to find the basic cause of the phenomenon. We now feel that it is quite well established that consolidation of many types of emulsions is profoundly affected by the presence of calcium ion. It appears that the lime present in fresh plaster surfaces forms a rich source of these ions while the less soluble calcium carbonate to which it is ultimately converted does not and that this accounts for the different behavior of plaster surfaces of varying age. Alkalinity seems not to be an important factor since barium hydroxide, a much stronger and more soluble alkali does not have a comparable effect while neutral calcium salts produce it readily. The effect can be avoided by pretreatment of the plaster with materials which insolubilize or otherwise inactivate the calcium such as ammonium oxalate or sodium hexametaphosphate. The mechanism by which calcium ion interferes with film consolidation is still not known.

For an ordinary interior flat wall paint based on a standard vinyl acetate copolymer emulsion, Formula A is given. This paint consistently shows bad color variations over fresh plaster surfaces or on test panels treated with lime slurry. A second formulation (Formula B) of the same type utilizing a microparticle size copolymer emulsion as the vehicle is also

given. This paint, in contrast to the first, has shown excellent behavior over lime bearing surfaces both in the laboratory and in a limited number of field tests.

We feel the significant differences between these two formula are:

1. The use of a microparticle size copolymer emulsion in place of a conventional type.
2. The use of a water insoluble film consolidating agent and, at the same time, the avoidance of water soluble solvents.
3. The use of non-ionic thickeners and wetting agents to the maximum possible extent and, conversely, the avoidance of anionic materials. Any tinting color dispersions used should also be predominantly non-ionic in nature.

Thus, making use of the superior film forming properties of the new microparticle size vinyl acetate copolymer emulsions and putting to use the new knowledge we have gained concerning film consolidating agents, wetting agents, and thickening agents we have been able to obtain much improved and far more dependable results on lime-bearing surfaces than have heretofore been possible with this type of vehicle.

Problem of Efflorescence

Lack of dependable film formation is also suspected of causing or contributing to certain problems occasionally encountered in exterior painting. Efflorescence is certainly a case in point. In many instances, the moisture permeability of PVA films is an advantage since it permits the relief of pressures which seem to cause blistering and peeling of paints based on more water vapor-proof materials. On porous substrates which contain soluble salts or lime, however, such as some types of asbestos-cement shingles, a ready permeability to moisture tends to permit the rapid diffusion of these materials to the surface. Water-soluble substances wash off and do no harm but when lime reaches the surface, it is converted to calcium carbonate by the carbon dioxide of the air. It then remains on the surface as a fine powdery deposit dulling the color and presenting a poor appearance. This is the most common form of efflorescence. Recently, a laboratory study has been completed using a blister and stain tester of our own design and a test method first used by Maurice Van Loo and his coworkers at the laboratory of the Sherwin-Williams Company in Chicago. It has confirmed that the greater film forming ability of the microparticle emulsions is of great assistance in reducing the tendency of paint films to effloresce on asbestos-cement shingles. The Formula C shows very good resistance to efflorescence in laboratory tests. Some further improvement is shown by omitting the Daxad 30 which, in this formula, serves only to simplify manufacture.

"Framing"

One of the problems of painting with exterior emulsion paints seems to be peculiar to Florida area. This is the "framing" observed in many cases when this type of paint is used on stuccoed concrete block walls. In this type of failure, the color of the paint will become lighter in the areas over the mortar joints between the blocks even though these have been covered with stucco before painting. It has so far not been possible to duplicate this phenomenon in the laboratory and its exact cause is still in doubt. There is much indication, however, that here again the basic trouble is film consolidation, in this case differences in degree of consolidation on different parts of the surface. The direct cause of the color change may be a form of efflorescence or it may be a non-uniform premature chalking phenomenon. In either case, modifications tending toward better film formation would be expected to show improved performance and in field tests over a period of several months, this has so far proved to be the case. The use of microparticle size emulsions in formulas similar to that of Formulae B & C, the first of which was effective in eliminating color variations in interior paints used on fresh plaster, have proven effective in eliminating complaints of this sort during an admittedly limited trial period.

Water Spotting

Many of you have heard discussion of another exterior paint problem, that of water spotting or streaking which is most frequently reported in the West Coast area.

Dispersion	**Lbs.**	**Gals.**
Water	175.0	21.0
Dispersing agent (Daxad 30)	2.0	0.2
Non-ionic wetting agent (Nonic 300)	1.5	0.17
Non-ionic wetting agent (Daxad 32) (20%)	7.5	0.86
Rutile titanium dioxide	200.0	5.72
Calcium carbonate	100.0	4.65
Phenyl Mercuric Borate	0.2	—
Reduction		
Defoamer) Pre-mix and add (	1.0	(1.95
Water) (	15.0	(
3% Methocel 65 HG 4000 cps.	140.0	16.80
Butyl Cellosolve Acetate	10.0	1.30
Microparticle size vinyl acetate copolymer emulsion (55%)	336.0	37.30
Water	67.0	8.04
Water and/or 3% Methocel 65 HG solution	16.75	2.01
Totals	1071.95 lbs.	100.00 gals.

Directions

1. Disperse the first seven items on a high speed stone mill or Cowles dissolver to a North grind gauge reading of 5.
2. With slow speed agitation add the remaining items to the pigment dispersion in the order given.
3. Adjust the volume with either water and/or Methocel as indicated by viscosity check.

Physical Constants	
Weight per gallon	10.7
Pigment Volume Concentration	35.3%
Total solids	45.2%
Viscosity	75–80 KU

Formula C: White exterior paint base for light pastel tints based on microparticle size vinyl acetate copolymer emulsion.

On certain parts of the West Coast, rain is infrequent of absent during long periods of the year while fog and heavy dew are common. This situation combines with a predominantly eaveless style of architecture to make emulsion paint films especially vulnerable to water streaking. Small amounts of water condensed on the top of masonry walls eventually run down the wall surface extracting water soluble material from the film and redepositing it on the film surface during drying. At very least these streak-like deposits of water soluble material cause readily noticeable variations in the sheen of the film. Since the materials are good adhesives, they also gather dirt which makes for a color contrast. Finally, on continued exposure to sunlight these deposits appear to become water insoluble rendering the streaks permanent so that even heavy rain will not remove them.

Here, we can take advantage of two features of the microparticle size emulsions, namely, their low content of water extractable material and the fact that protective colloid materials like polyvinyl alcohol are absent. In an exterior formulation such as Formula C, a microparticle size copolymer has been used as the vehicle and care has been taken to limit the water soluble content of the film as far as possible in every way. The result is virtually complete freedom from water spotting. Of course, it will be a long time before we have a complete story on the exterior performance of this formulation in respects other than water spotting behavior. At the end of six months exposure, however, no defects have become apparent.

Gloss Finishes

We have seen where microparticle size polyvinyl acetate type latices are solving some of the problems which have been met with in expanding the present uses of PVA paints. They may also make it possible for polyvinyl acetates to enter new fields. Two of the most interesting characteristics of the microparticle size emulsions are the clarity and gloss of their films which give us hope that we can some day make high quality water base gloss and semi-gloss finishes for trade sales and architectural use. When we can do this, we will have broken another barrier and opened another field to latex and polyvinyl acetate. Let me say that so far the difficulties in doing this are not in getting satisfactory levels of gloss but in obtaining good hardness, adhesion and flow properties. As of this date some manufacturers are approaching the goal by modification with polyester type resins. Whatever the final answer, I feel that the microparticle size emulsions will be a part of it because their films are inherently glossier and clarity is improved by their lack of protective colloids.

Formula D is an experimental gloss paint formula based on an unmodified microparticle size copolymer emulsion. It has a gloss in the required range but is lacking in the qualities of film hardness and flow properties and the gloss seems to decrease somewhat as the paint is stored. In spite of these defects, we feel the properties of this paint show a great deal of promise and warrant further investigation along this line.

Summing up the preceding paragraphs, it is evident that a single basic development in polyvinyl acetate emulsions has been exceedingly helpful in mounting new attacks on existing problems and has opened up at least one possibility of expanding the use of PVA to a new field, that of gloss and semi-gloss latex paints.

Individual developments in the science or, as many of us are tempted to call it, the art of formulating PVA type paints are more difficult to single out, although we know that we make better quality, less costly and more trouble-free products today than at any previous time. Perhaps the clearest example of an advance lies in our use of more powerful and less water-soluble film consolidating agents. In the past water soluble materials such as hexylene glycol, Carbitol, Cellosolve, and Carbitol Acetate have figured prominently in our formulations. Their purpose is to assure good film formulation at high levels of pigmentation and low application temperatures. Experience has finally forced us to the conclusion, however, that the first three of these materials are not sufficiently powerful solvents for many of the resins to allow them to function efficiently. None of them seems to perform as well on porous surfaces as water insoluble materials like butyl Cellosolve acetate

Dispersion	Lbs.	Gals.
1. 2½% sol. hydroxy-ethyl cellulose (Cellosize WP-4400)	70.00	8.40
2. Non-ionic wetting agent (Igepal CTA 639)	1.00	.11
3. Water dispersible lecithin	5.50	.63
4. Polyglycol P-1200	3.00	.35
5. Rutile titanium dioxide	200.00	5.72
6. Phenyl Mercuric Borate	0.20	—
7. 2½% sol. Cellosize WP-4400	60.00	7.20
8. Water	50.00	6.00
9. Non-ionic wetting agent (Igepal CTA 639)	.60	.07
10. Defoamer	1.75	.25
11. Water for mill wash	8.34	1.00
Reduction		
12. Microparticle size vinyl acetate copolymer emulsion 55%	480.0	53.40
13. Water	141.30	16.87
Total Yield	1021.69	100.00

Physical Constants

Weight per gal.	10.22 lbs.
Pigment Vol. Conc.	17.4%
Total solids	48%
Viscosity	70-75 KU
Gloss 60-70 @ 60°	

Directions

Mix materials #1 - #6 thoroughly in a Troy or equivalent mixer. Add materials #7 - #10 and mix thoroughly. Pass twice through high speed stone mill followed by wash water. Reduce with materials #12 and #13 with good agitation.

Formula D: Starting point formulation for an interior gloss paint based on a microparticle size vinyl acetate copolymer emulsion.

butyl Carbitol acetate or even, in a few cases, toluol. We think this is because the water soluble materials tend to be carried into the porous substrate and thus are absent from the film at the critical time of its formation. Where considerations of odor and freeze-thaw resistance permit, therefore, we now frequently suggest the use of the water insoluble solvents mentioned particularly butyl Cellosolve acetate.

PVA for Wood

In the category of new uses for the polyvinyl acetates in coatings, probably the first development which should be mentioned is the use of PVA type paints on exterior wood surfaces. Progress in this field has been slow and has covered a long period of time but today an increasing number of manufacturers of PVA paints are selling their products as suitable for all surfaces including exterior wood. Their confidence is based on the results of panel and house painting tests carried on continuously since 1953 which have exposed the principal potential sources of difficulty and indicated methods of neutralizing many of them. I feel that this optimism is justified provided it is realized that the data available is still rather limited and that there are some problems whose solutions have not been fully worked out.

All of the data with which I am familiar points to the superiority of internally plasticized vinyl acetate copolymer emulsions over externally plasticized homopolymer emulsions for this application. This is undoubtedly due to the greater flexibility and extensibility required in the film to enable it to follow the dimensional changes induced in the wood by changes in moisture content and temperature.

The problems which may be encountered in painting wood with PVA paints can be considered conveniently in two groups, one having to do with previously unpainted surfaces and the other with surfaces previously painted with oil paint.

On new wood, PVA paints have the advantage of avoiding blistering and peeling because of the high moisture permeability of the films. This same quality, however, gives rise to two other difficulties to which there are as yet no completely satisfactory answers. The first is the occurrence of wood stains in light colored paints applied over cedar and redwood. These stains appear at once when such surfaces are painted and usually disappear gradually during the first months of exposure. So far the only method of controlling them without sacrificing moisture permeability, is to prime with a special PVA based primer containing lead acetate, an extremely toxic substance whose indiscriminate use for this purpose is certainly not advisable. The second problem is the incidence of cracks in the film along the grain of the wood. These are apparently due to the more rapid transpiration of water through the film and are more severe on some types of wood than on others. They also occur more readily on dark colored paints because their films absorb heat more rapidly from sunlight thus further accelerating changes in the wood's moisture content. Normally, no loss of adhesion is noticeable and from a distance the film appears intact. The use of the more highly internally plasticized copolymers helps in overcoming this condition. Priming with an oil base primer eliminates stains and greatly improves grain-cracking behavior but at a sacrifice of blister and peel resistance. Another matter which has come to light in our tests is that PVA paints applied over new wood often require extra protection from mold and mildew attack. Frequently in panels exposed side by side the same formulation which gives satisfactory mold inhibition on asbestos-cement shingles will be badly infested on a wood substrate. Also, nails and

Dispersion	**Lbs./100 gals.**	**Gals.**
Water	50	6.0
Tetra potassium pyrophosphate	1	0.05
Dispersing agent (Daxad 30) 25% soln.	8	0.96
Non-ionic wetting agent (Igepal CTA 639)	1	0.11
Polyglycol P-1200	2	0.23
Phenyl mercuric borate	0.2	—
3% Methocel 65 HG 4000 cps. soln.	70.0	8.40
Rutile titanium dioxide	215.0	6.14
Anatase titanium dioxide	25.0	0.77
Mica 325 mesh	30.0	1.30
Magnesium silicate	31.0	1.30
Water	60.0	7.20
Defoamer	1.0	0.15
Reduction		
Carbitol acetate) Pre-mix and add	20.0	2.42
Water)	109.6	13.14
Highly internally plasticized vinyl acetate copolymer emulsion (51%)	385.0	43.25
3% Methocel 65 HG 4000 cps. soln	20.0	2.40
Viscosity Adjustment		
Water and/or 3% Methocel 65 HG 4000 cps. soln	51.5	6.18
Totals	1080.3 lbs.	100.00 gals.

Directions

1. Combine the first 11 items in a change can mixer until a smooth homogeneous paste is formed.
2. Add the remaining water and defoamer to the mixture, and give the mixture one pass through a high speed stone mill.
3. The materials used in the reduction are added to the dispersion in the order given with good agitation.

Physical Constants

Weight/gal.	10.8
Pigment volume conc.	32%
Pigment solids	27.9%
Total solids	46.2
Viscosity	75 ± 5 KU

Formula E: White exterior paint based on a highly internally plasticized vinyl acetate copolymer emulsion.

Dispersion	Lbs.	Gals.
Water	271.2	32.54
Dispersing agent (Daxad 30)	3.4	.34
Non-ionic wetting agent (Nonic 260)	2.3	.38
Anionic wetting agent (Aerosol OT-B)	1.0	—
Phenyl Mercuric Borate	0.2	—
Rutile titanium dioxide	67.8	1.94
Calcium carbonate	237.3	10.42
Defoamer	1.7	.25
Reduction		
Asbestos Fibre 5K	84.75	2.98
3% Methocel 65 HG 4000 cps. solution	203.4	22.92
Vinyl acetate copolymer emulsion 51%	250.9	28.23
Totals	1123.95	100.00

Directions

1. Mix the first five items under Cowles dissolver, then add pigments and grind for 10 to 15 minutes.
2. Add defoamer and agitate slowly for one to three minutes.
3. Transfer dispersion to change can mixer and add last three items in order given under moderate agitation.

Physical Constants

Weight per gallon — 11.24 lbs.
Total solids content — 46%

Formula F: Roof coating mastic based on a vinyl acetate copolymer emulsion.

Dispersion	Lbs./100 Gals.	Gals.
Water	150.0	18.00
Dispersing agent (Daxad 11 KLS)	2.0	0.15
Tetra potassium pyrophosphate	2.0	0.10
Non-ionic wetting agent (Emulphor EL-719)	2.0	0.22
Phenyl mercuric borate	0.2	—
50% Aq. soln. hexylene glycol	28.0	3.36
Rutile titanium dioxide	200.0	5.72
Anatase titanium dioxide	25.0	0.77
Calcium carbonate	160.0	7.07
Talc	150.0	6.34
Defoamer	1.5	11.50
Water	96.0	11.50
Reduction		
3% Methocel 65 HG 4000 soln.	58.0	6.95
Vinyl acetate copolymer emulsion (55% T. S.)	360.0	39.60
Total yield	1234.7	100.00

Directions

1. Mix the first 11 items in a change can mixer to a smooth homogeneous paste.
2. Add the remaining water under "dispersion" and give one pass through a high speed stone mill.
3. Add the items of the reduction to the dispersion with good agitation.

Physical Constants

Total solids	59.3%
Pigment solids	43.3%
Pigment vol. conc.	49%
Viscosity	124 KU
Reflectance	90%

Formula G: White roof coating based on a vinyl acetate copolymer emulsion.

other fastenings must be galvanized or aluminum. Ordinary steel nails cause rust stains if left exposed and even if countersunk and covered may be subject to rapid corrosion under some conditions.

Potential problems in repainting surfaces previously coated with oil paint reduce largely to those of getting satisfactory adhesion to a surface which may vary from very chalky to quite glossy and at the same time is slightly water repellent. Here again, the softer copolymers seem to help and in early work it was found that wetting and dispersing agents which functioned well in interior paints seemed to have disastrous effects on the adhesion when used in exterior work. We have not had any recent failures in our exposure program due to loss of adhesion between a coat of PVA paint and an underlying oil paint layer. The most frequent cause of failure in this kind of painting is loss of adhesion of the oil paint layer to the wood. This type of failure may of course occur no matter what type of paint is used for repainting and it is always difficult to tell how much the final coat contributed to the failure. Again we suspect that, at least in variable climates like that of New England, the softer copolymers and those whose films show the least water absorption give the best results. An example of a formula which is performing very well on a variety of exterior wood exposures is Formula E.

Chalky Surfaces

In our test exposure work we have not encountered the problem of painting on heavy chalk deposits. It is doubtful if any latex paint will give dependably satisfactory performance when used on such surfaces. The bond formed with such a surface can be no stronger than the surface itself which is usually quite weak. Our best results on simulated chalky surfaces have been obtained, we feel, by putting as little strain on the unavoidably weak adhesion as possible. This is accomplished mainly by choosing an emulsion whose films have a particularly low characteristic water absorption. This

(*Turn to page 99*)

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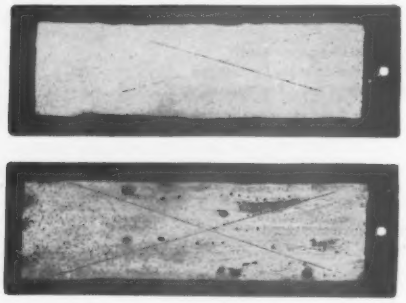

B-1030

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B-1030 has demonstrated superior corrosion resistance. The steel panel shown at top was coated with B-1030, the other with WP-1. Each was exposed without topcoats to 5% salt fog for 500 hours. When the wash primer films were removed the panel protected by B-1030 showed much less pitting.

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By
Phil Heiberger

The author continues his random reflections on various aspects of the paint industry. The opinions expressed in this column are his alone and do not necessarily reflect those of this publication.

Solid Reactions

The information provided in A. D. Hibberd's paper, *Coloured Emulsion Paints for Exterior Use*, published in the February 1959 *Paint Technology*, should be common knowledge by now. The finding that dry mixtures of pigments are also subject to loss of color under the action of oxygen and sunlight strikes me as being significant and pertinent to the solution of many hitherto unsolved practical paint problems.

P. Heiberger

Chalking is a familiar phenomenon and it is "explained" (sic) by stating that it results from the loss of binder from the paint surface due to the combined action of moisture and light, leaving the pigment tenuously held on the surface.

Asking "why is the chalk from most coloured paints white?" Hibberd carried out a series of experiments which are described in his paper. The following facts emerge:

"1. 'Fading by chalking' appears to be true fading of the coloured pigment and not the result of masking the unfaded paint by a layer of white 'chalk.'

"2. This type of fading occurs rapidly when dry mixtures of white and organic coloured pigments are exposed to actinic light, but only manifests itself in paints when the protective layer of the medium has been removed from the surface.

"3. Anatase titanium dioxide causes quicker fading than does the rutile grade, but these pigments are not alone in this property, and a similar phenomenon is observed with many other white pigments and extenders.

"4. Only inorganic pigments seem to resist this type of fading and even some of these are susceptible."

From the above facts the author draws the following conclusions:

"1. Oxygen as well as actinic light is necessary to cause fading of otherwise fade-resistant pigments.

"2. Loss of colour is due to oxidation, and with organic pigments, is the result of destructive oxidation. This is supported by the 'fading' of carbon black, which can be due to no other cause than its destruction.

"3. The paint medium itself is capable of providing the coloured pigment with the necessary protection from atmospheric oxygen while the surface of the film remains intact."

Gaps in Knowledge

These findings certainly add a new dimension to what should be a major area of paint research, namely, the study of solid phase reactions.

The failure of the paint industry to carry out needed research was recently emphasized in a book highly praised by the reviewers in the trade journals. I refer to the group of lectures gathered in the volume entitled *Surface Phenomena in Chemistry and Biology* (Pergamon Press, N. Y., 1958), particularly Chapter 11.

This chapter, written by F. A. Askew, is called, *Some Notes on the Surface Chemistry of Surface Coatings*. In it the author states, "The surface coating industries. . . . . provide many examples of empirically observed phenomena and technically useful processes which lack satisfactory explanations, primarily owing to lack of fundamental knowledge. This contribution, therefore, consists principally of notes of gaps in our knowledge, rather than achievements in filling them.

"Fundamental and academic knowledge of the surface chemistry of the systems is lacking because: 1. Organic liquids used do not differ greatly from each other in surface tension and are not susceptible to the spectacular reduction of this property brought about in aqueous solution by surface active agents. 2. Organic liquids are non-conducting, and surface active agents depending on ionic phenomena are ineffective. 3. The media used are complex; raw linseed oil probably contains more than 30 triglycerides.

"The difficulties are increased by the fact that very little is known about the shape, size, size distribution, *or even the surface composition of the pigments in common use.* (Italics mine.) Attempts to apply surface chemical principles derived from a study of single substances in relation to aqueous solutions are beset with difficulties."

Most of the chapter is taken up with discussions on wetting, dis-

persion, flocculation, consistency, leafing and printing processes. In the conclusion, Askew states, "If (these notes) have served to indicate points at which the attention of academic workers could be directed, with useful results from both the theoretical and technical points of view, they will have fulfilled their purpose. The literature is scattered, and there has, in this field, opened a particularly wide gap between the 'pure' and 'applied' sides of the subject. This has been made wider than it need have been by the reluctance of certain learned societies to accept accounts of work carried out necessarily with 'impure' materials. Some bridges across the gap are provided by the Industrial Research Associations, but most of the workers in the technical field would welcome the provision of more bridges."

Semantics

Paint industry commentators are constantly reproaching their hearers and readers for the lack of research, the low quality of research, and the serious inroads being made by the plastics, metals, and ceramic industries in applications traditionally preempted by organic coatings. I strongly suspect that these dire warnings rarely reach the ears or eyes of those few individuals who are really capable of changing the situation.

In this day and age, special interest groups, be they doctors, lawyers, teachers, social workers, physical therapists, musicians, or paint technologists, frequently find themselves in a characteristic predicament. Each group feels strongly that its specialty is misunderstood by the public, undersubsidized, and misdirected. But, sad to relate, the most avid listeners to the self-righteous complaints are usually other complainants in equally ineffective positions.

Question any industry executive and you will learn that the paint industry is spending as much money for research as it can justifiably allocate. And don't be surprised if you detect a note of dissatisfaction with the return on that investment. The problem may well be one of defective communication. Research means one thing to scientific personnel and quite another to non-scientific business-oriented personnel. The misunderstandings thus engendered seem to increase in geometric progression.

Definitions of research run the gamut from the idealist's conception of a fascinating search for truth without regard to specific commercial goals to the dollars-and-cents view which means inclusion of every overhead item, even quality control, customer service, and raw material evaluation. In sum, it boils down to this: definitions are made by people, each with his own personal prejudice and his own frame of reference. The manufacturer who budgets customer service and quality control as research items cannot readily be reconciled with the academic-minded scientist who thinks research means exploration in uncharted areas. Trouble brews when the same key words mean entirely different things to different people.

An agreement on definition would be a forward step. Non-research technical functions, such as sales development, cost reduction, quality control, raw material standardization, purchasing assistance, customer service, and production problems should be recognized and identified as such, and definitely divorced from research. A clarification of terminology is vital if non-scientifically oriented managers are to be convincingly shown what the critics have pointed out—that the paint industry does not do enough real research in proportion to gross sales.

Modus Operandi

An adequate definition of research, proper budgeting of available funds, the question of independent, cooperative, or sponsored research, the type of problems to study, and the techniques of research, administration are all subjects of much controversy. The paint industry should be recognized as a technical industry in which many technical activities are necessary for the proper execution of formulation, production, sales, and distribution functions. In a sense, these functions are primarily commercial since their performance is vital for immediate survival.

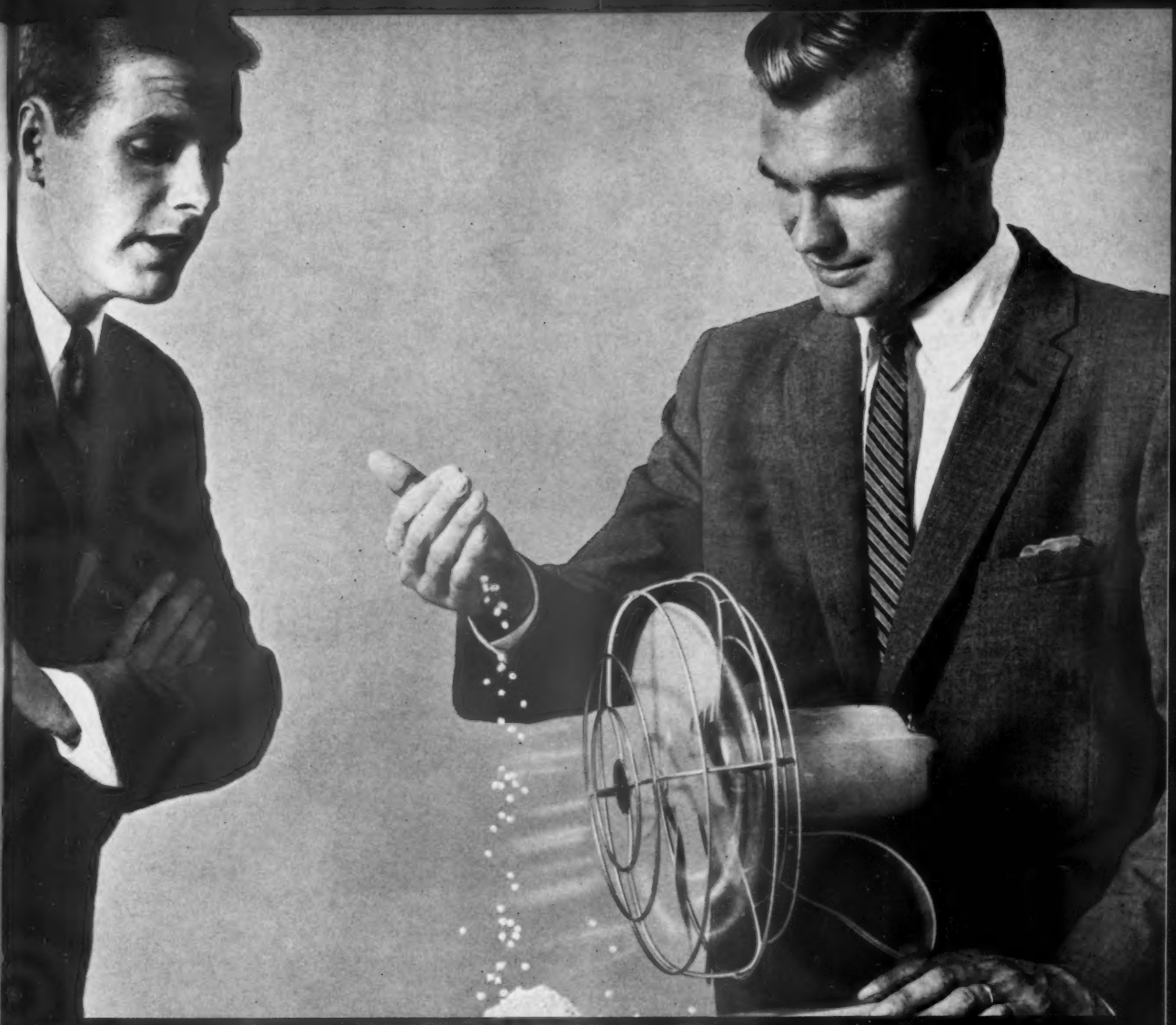
Long range problems related to the creation of new markets and new products as well as the traditional problem-solving activities, in my opinion, may be fittingly called research. Surely it is the failure to tackle the long range problems that is disturbing so many people, not only the solid stage reactions and the problems of surface chemistry mentioned earlier, but the many associated problems involving dispersion, rheology, deterioration and the like. These problems are extremely complex and require highly trained specialists and expensive equipment. I am sure if Hibberd's findings involved the discovery of a salable additive, interest would be intense.

The ability to use existing and new raw materials to the best advantage is the problem that the paint industry must solve for itself. It may well be that solutions to the serious problems of the industry (such as control of surface forces occurring in the liquid paint, the solid state reations occurring in the paint film, the technique of dispersing pigments in vehicles to attain the desired stability, color, and application properties) may not involve the synthesis of salable packageable items.

There is a distinct possibility that solving some of these problems may involve concepts and techniques beyond the comprehension of the present day commercial and technical managements. An admission that competent scientific research is a highly specialized art may be called for. The situation may not be too dissimilar from that of the man with a headache who prescribes for himself and takes an aspirin (short range problem-solving). However, when the headache persists and a serious illness is suspected, he places himself in the hands of a doctor who would not entertain the idea of limiting his therapy only to those drugs or techniques known to the patient.

In this day of specialization and interdependence, the patient need not acquire the knowledge and training of the physician to be cured by him. Likewise, research activities need not be readily comprehensible to specialists in other areas, nor need these activities be limited to areas that are comprehensible to non-technical specialists.

A good start has been made in the establishment of an industry wide Paint Research Institute. Let us consider this only a start.



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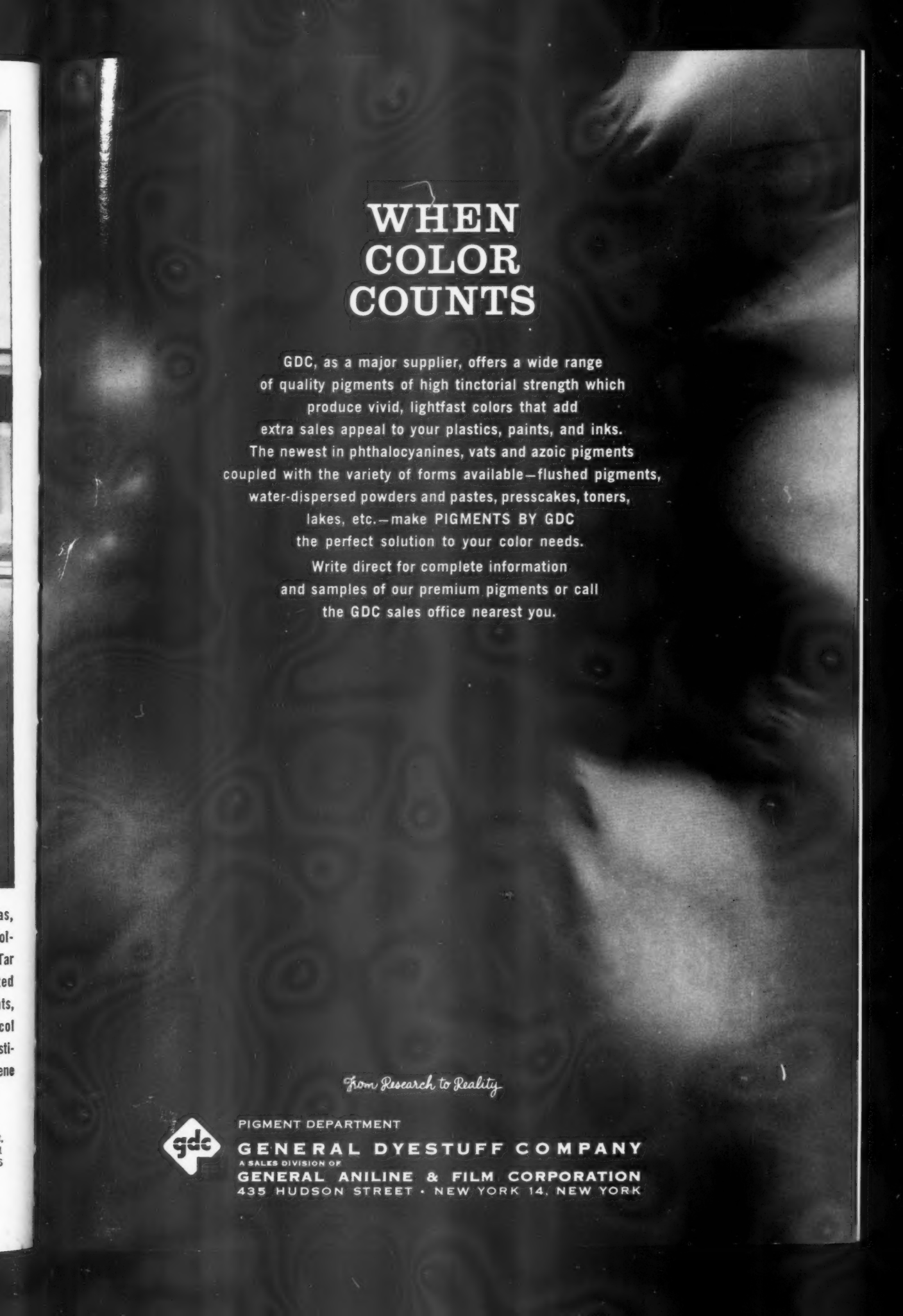
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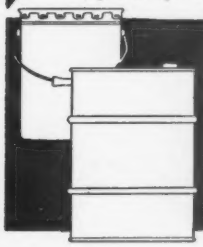

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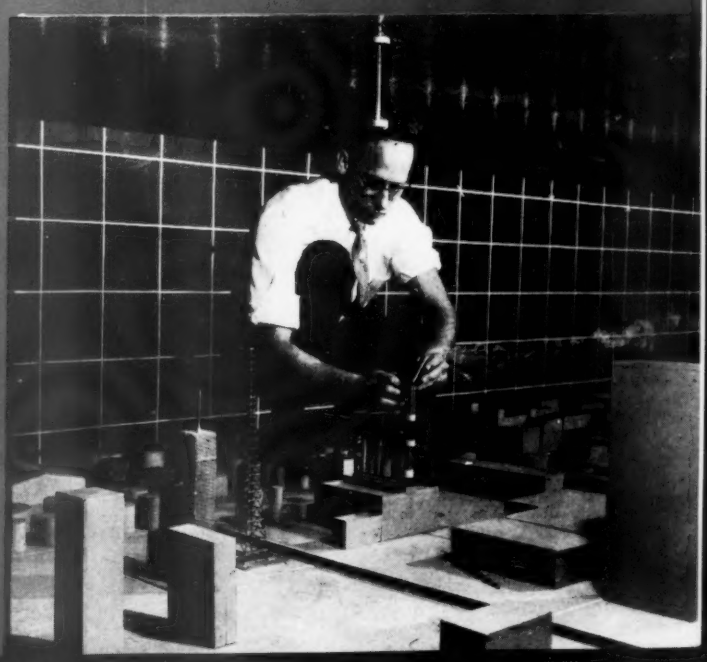
Research scientist at New York University's College of Engineering study ways and means to eliminate or reduce atmospheric pollution by using model size industrial plant. Actual gases and temperature such as oil fog from minature stack are simulated. Various wind velocities and directions plot course of pollution. See page 61 for details on how to control atmospheric emissions from paint and varnish manufacturing operations.



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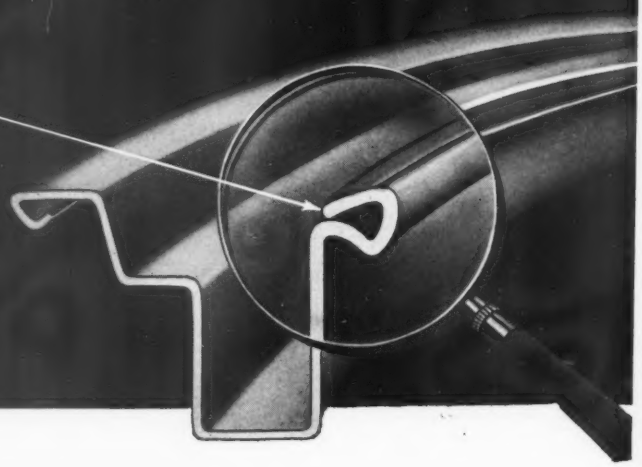

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Controlling

ATMOSPHERIC EMISSIONS from PAINT and VARNISH OPERATIONS

Part I

By
Robert L. Stenburg*

PRESENT day protective coatings are the products of precisely controlled chemical reactions and accurately proportioned formulations which may include natural or synthetic drying oils, resins, pigments, volatile solvents, rapid driers, plasticizers, metallic soaps or anti-oxidants. A major component of most coatings is the oil or resin vehicle, the manufacture of which may involve subjecting one or more complex organic materials to chemical reaction at elevated temperatures in order to attain the properties desired for a particular application. During these reactions, or cooking operations, there is some decomposition of the basic constituents with the result that a portion of the kettle ingredients is vaporized or otherwise lost to the surrounding atmosphere to be carried off in the form of gases, liquids and solids. Other atmospheric losses in this industry result from (1) the hot or cold thinning of lacquers, varnishes, resins and oils with volatile solvents and thinners to provide a proper consistency to the intermediate or end product, and (2) the storage or handling of both raw materials and intermediate products.

Because of the large volume and wide variety of oils and resins processed, and because of the type and amount of materials lost to the atmosphere during the high temperature cooking processes, the production of paint and varnish vehicles establishes itself as the principal source of atmospheric pollution in this industry. The term "fumes" is commonly applied to these cooking losses. Since recovery of these fumes has so far proven uneconomical, they are usually collected by hoods, enclosures and duct systems and are discharged to the outside air either directly or after some degree of treatment. Many of the chemicals discharged are undesirable as atmospheric constituents, and fall into the category of air pollutants. Under certain atmospheric conditions the undesirable quality of some pollutants in the air is compounded by chemical interaction and is intensified by sunshine. Increasing concern of health officials regarding air pollution and the growing demands by the general public for increased air pollution controls make it desirable to review some of the problems and considerations involved in determining the type and degree of air pollution controls which are or may be required in this industry.

This series is based on a review prepared at the request of the National Paint, Varnish & Lacquer Association by the U. S. Department of Health, Education, and Welfare, Public Health Service, Bureau of State Services, Division of Sanitary Engineering Services, at the Robert A. Taft Sanitary Engineering Center in Cincinnati, Ohio.

Part I is concerned with the sources of atmospheric pollution covering the cooking processes, mixing and thinning processes, and other miscellaneous sources. Part II, scheduled for our October issue, will discuss methods of controlling atmospheric emissions.

Reasons for Control

Although the immediate health effects of air pollutants are of prime importance in establishing the need for air pollution control, other factors include aesthetic considerations of man's environment and damage to vegetation and property. The situation requiring control of undesirable atmospheric emissions may vary from plant to plant and from locality to locality. Control may be voluntary or it may by enforced as a result of a legalized air pollution control agency, public pressure, or court order. Following are the specific conditions which may require air pollution control at a given plant:

Toxic Materials

The discharge of gases, vapors, or particulates into the atmosphere which are toxic or otherwise injurious to humans, animals or vegetation will obviously require immediate control.

*Senior Sanitary Engineer, Engineering Research & Development, Community Air Pollution Program.

Smoke and Dust

Smoke and fly ash from combustion processes have long been recognized as undesirable atmospheric components. Most air pollution control ordinances specifically limit the discharge of these materials into the atmosphere.

Objectionable Odors

Whenever materials having objectionable odors are discharged to the atmosphere, they create an undesirable environment. A malodorous material need not be injurious to health to be considered undesirable. For legal purposes, odors are generally classified as nuisances, and ordinances prohibiting nuisances exist at almost every level of government. Ample evidence exists to indicate the attitude of courts in holding creators of odor nuisances responsible for the control of such odors. A number of the organic raw materials used in the protective coatings industry, and many of the decomposition and distillation by-products from such processes as heat polymerization and esterification of oils and resins, have highly disagreeable odors. The reduction or elimination of these odors is the principal reason that control of atmospheric emissions is required of this industry.

Property Damage

Materials discharged to the atmosphere may be chemically active liquids, solids or gases capable of reacting with such construction materials as stone, brick, cement, metals and surface coatings. Their effects will often be most noticeable on structures and automobiles immediately adjacent to the plant where they are discharged. One example of property damage resulting from vehicle production is the cooking of drying oils with phthalic anhydride. Water scrubbed fumes from the varnish kettles have been known to condense and freeze on the inside of exhaust ducts. With warming of the metal ducts, the ice breaks loose and becomes finely pulverized on passing through the exhaust fans. As a result, a fine aerosol of ice particles containing phthalic anhydride is discharged to the atmosphere and cars parked in the vicinity of the plant may suffer extensive pitting of the exterior paint as these particles settle.

Smog Formation

The atmospheric phenomenon commonly known as "smog" results from a combination of factors including the irradiation of atmospheric pollutants under proper meteorological conditions. While this process is not yet entirely understood, the materials presently thought to be of greatest importance in producing "smog" include oxides of nitrogen, unsaturated hydrocarbons (particularly olefinic) and ozone. Smog is most likely to occur in areas where a variety of chemical industries discharge large quantities of hydrocarbons to the atmosphere. Stagnant meteorological conditions which permit the concentration of pollutants to build up in the atmosphere and simultaneously provide a lengthened atmospheric reaction time appear to be additional factors conducive to smog formation.

Degree of Control Required

When odor problems are involved, the degree of control required may depend much on plant location. For example, objectionable odors emanating from a plant in or near a residential area will eventually become the object of complaints which sooner or later force the plant to effect sufficient controls to stop the complaints. Another plant using the same raw materials and manufacturing processes but in a less populated or strictly industrial location may get by without the need for controlling their emissions simply because the discharged material undergoes sufficient dilution to render the odors much less noticeable by the time they reach populated areas.

Sources of Atmospheric Pollution

Except for pigments, the majority of materials used in the manufacture of protective coatings are of organic composition with varying degrees of volatility; therefore, their storage, handling, mixing, and processing will produce different amounts of atmospheric pollution depending on the particular raw materials used, the combinations in which they are mixed, and the conditions to which they are subjected. Coatings are individually developed to satisfy an unusually wide variety of applications, and the basic vehicle is compounded to acquire special properties by adjusting both its chemical composition and the cooking procedure required for its production. As a result there are innumerable combinations of organic mixtures and time-temperature cooking procedures being used in the industry.

Cooking Processes

In the manufacture of paint and varnish vehicles, cooking is employed for bodying natural and synthetic oils; for the preparation of straight and oil-modified alkyds; for processing short, medium and long oil varnishes; for polymerizing acrylic monomers; and for the conditioning of many other products. Through such reactions as oxidation, polymerization and esterification, the raw materials are transformed, by the application of heat, from their previous states to varying consistencies and compositions. Commonly used natural oils include linseed, soybean, perilla, tall, castor, oiticica, fish, and tung, while chemicals may include glycerine, phthalic anhydride, litharge, fumaric acid, pentaerythritol, various resins including rosin and many other substances depending on the process involved and the properties required of the final product. Cooking temperatures range from 200°F. up to 600°F. and are ordinarily maintained for several hours. Eight to twelve hours is an average length of cook, although some processes require heating for as long as 24 hours.

Decomposition of the kettle ingredients by vaporization, cracking, destructive distillation and chemical reaction produces fuming. This starts at around 350°F. in the average oil or varnish kettle. The rate of fuming rises with temperature increase and reaches its maximum when or shortly after the highest processing temperature is reached. Fuming continues so long as heating is continued. Gases so released may combine with solid or liquid particles by absorption or adsorption. Liquid droplets may become entrained in bubbles leaving the reactant to be picked up by the gas or air stream passing over the kettle. Solid particles may escape in the form of dust, as wetted particles in liquid droplets, or, if soluble, as droplets of solution.

Bodying oils	Running natural gums	Manufacturing oleoresinous varnish	Manufacturing alkyd varnish
Water vapor	Water vapor	Water vapor	Water vapor
Fatty acids	Fatty acids	Fatty acids	Fatty acids
Glycerine	Terpenes	Glycerine	Glycerine
Acrolein	Terpene oils	Acrolein	Phthalic anhydride
Aldehydes	Tar	Phenols	Carbon dioxide
Ketones		Aldehydes	
Carbon dioxide		Ketones	
		Terpene oils	
		Terpenes	
		Carbon dioxide	

Table 1. Composition of oil and varnish fumes.

Losses to atmosphere will vary depending on composition of ingredients, rate of temperature application, maximum temperature attained, method of introducing additives, degree of stirring, type and extent of air or inert gas blowing, and length of time kettle is held at maximum temperature. Maximum losses normally occur during the high temperature cycle of the cook. Total loss of oleoresinous varnish cooks may average 3 to 6% with some losses reported as high as 10-12%. Losses from the production of alkyd resins may range from 4-6%. Cooking and blowing of oils may produce from 1 to 3% loss, while heat polymerization of acrylic resins may run less than 1%, unless the reaction gets out of control and overflows the kettle.

Most modern plants employing high temperature processes use closed kettles vented through a duct system to a central discharge point. Some smaller plants still use open kettles, but these are usually hooded and vented through a duck system.

The composition of fume constituents given off during heat processing of the four major classes of oils and varnishes as listed by J. J. Mattiello (16) is shown in Table 1. Using infrared spectrometer techniques, C. W. Selheimer, et al (12) (13), identified the functional groups present in the fumes from several high temperature polymerization and esterification processes (Table 2).

In the heat bodying of natural oils, saturated and unsaturated aldehydic substances are among the decomposition products produced. The harsh, pungent odors of short chain aldehydes are typical by-products of this as well as other cooking processes involving such oils. In addition to their objectionable odor properties, unsaturated aldehydes cause eye watering and nose and throat irritation. Acrolein (or acrylic aldehyde) which was used as a tear gas in World War I, is an unsaturated aldehyde commonly identified with oil cooking processes and is readily recognized by its disagreeable odor and irritating qualities. This is a decomposition product of glycerine which may have been included in the reactant as an additive or produced by breakdown of the oil during heating. Unsaturated aldehydes, acids and esters are likewise produced in varying degrees during the manufacture of oleoresinous varnishes and alkyd resins. The decomposition and reaction products of various additives to any process make their own distinctive contributions to the escaping fumes.

In the tall oil glycerine pentaerythritol esterification process, small quantities of sulfur in the tall oil are responsible for the creation of highly offensive odors in the fumes produced. Hydrogen sulfide is given off during the heating up period and n-butyl mercaptan (skunk odor) is produced during the high temperature cycle. The hydrogen sulfide odor from this process becomes more pronounced as the temperature of the cook is increased. Some suppliers are now refining tall oil in an effort to remove as much of the sulfur as possible before it is used in vehicle production.

It is of interest to note that both tall oil and pentaerythritol contain only carbon, hydrogen and oxygen (with a small amount of sulfur in the tall oil); however, the degradation or oxidation products comprising the fumes from the esterification of these materials might contain several thousand compounds including aldehydes, ketones, hydrocarbons, the sulfur compounds mentioned, and various organic acids such as ordinary saturated and unsaturated hydroxy, aldehydic, dicarbonylic and ketonic acids. The sulfur compounds, like a number of other malodorous components which create the primary air pollution problem from cooking processes, occur in concentrations which ordinarily cannot be detected by wet chemistry, infrared or mass spectrometry techniques, but are readily detected by the human nose.

The development of water emulsion and water soluble coatings in recent years has resulted in additional raw materials being used for making vehicles, and, as might be expected, this has brought about an increase in atmospheric odor problems. For example, in manufacturing latex coatings involving the polymerization of certain acrylic monomers such as methyl methacrylate, the monomer itself is highly volatile and has a strong sickening sweet odor. Control of the vapors from this raw material during storage and handling must be as complete as the control of fumes produced during polymerization.

Many of the odor problems resulting from the manufacture of paint and varnish vehicles are made exceedingly difficult because the malodorous compounds involved have very low odor thresholds and thereby create objectionable odor conditions even though they exist

Process and temperature	Kettle ingredients	Compounds identified	Odor
Heat polymerization of Linseed oil 575°F.	Linseed oil Admolene (a catalyzed linseed oil)	Saturated and/or unsaturated: Aliphatic fatty acids Aldehydes Aliphatic Esters Paraffins Olefins	Harsh, pungent odor characteristic of short chain aldehydes (cause eye watering to varying degrees)
3 Dark Linseed Oil 580°F.	Raw Linseed Oil	Saturated and/or unsaturated: Carboxylic acids Aliphatic esters Alkyl aldehydes Paraffins Olefins Unsaturated: Acids Esters Aldehydes	
0-Pale linseed oil 580°F.	Alkali refined linseed oil	Saturated and/or unsaturated: Aliphatic fatty acids Olefins	
1-Pale linseed oil	Alkali refined linseed oil	Saturated and/or unsaturated: Fatty acids Saturated Aldehydes Olefins	
00-Pale linseed oil	Alkali refined linseed oil	Saturated and/or unsaturated: Aliphatic carboxylic acids Unsaturated alkane esters Saturated alkyl aldehydes Olefins	
Tall oil alkyd 475°F.	Tall oil Glycerine Fumaric acid	Saturated and/or unsaturated: Carboxylic acids Esters Aldehydes Alcohols Paraffns Olefins Fumaric acid	Hydrogen Sulfide (Rotten egg odor)
Tall Oil Alkyd 560°F.	Tall Oil Glycerine Pentaerythritol		Very offensive —Hydrogen Sulfide, n-butyl mercaptan (skunk odor)
Soybean oil alkyd 475°F.	Soybean oil Glycerine Fumaric acid Rosin	Saturated and/or unsaturated: Aliphatic carboxylic acids Aliphatic alcohols Alkyl aldehydes Alkane esters Paraffns Olefins	Mild soapy & slightly lemon-like odor
Linseed oil alkyd 475°F.	Alkali refined linseed oil Glycerine Phthalic anhydride Litharge	Aromatic acids Aromatic esters Aromatic aldehydes Aliphatic Carboxylic acids Aliphatic Aldehydes Aliphatic alcohols	Typical linseed oil cooking odors (harsh and stinging)

Table 2. Odor and composition (by functional groups) of oil and varnish fumes.

in extremely dilute concentrations. Many such compounds have noticeable odors in concentrations of one part per million and less (Table 3).

Mixing and Thinning Processes

The addition of solvents and thinners to oils, resins, varnishes and lacquers may be an important source of air pollution where large quantities of highly volatile materials are involved. Many processes require the addition and mixing of solvents during the cooking process, in which case the amount of solvent lost to the atmosphere will be governed by its volatility, the temperature of the material to which it is added, the degree of mixing, and the extent of additional heating, if any.

Thinning of premixed paint pastes to the consistency required by the user involves dilution with aliphatic or aromatic hydrocarbons, alcohols, ketones, esters and other materials which are highly volatile at normal temperatures. Although some plants use open vat mixing with certain solvents, the volatility of most thinners requires that mixing be done in totally enclosed tanks to prevent appreciable losses of these expensive products. In general, the loss of solvents to atmosphere from such mixing amounts to no more than 1 or 2% of the solvent used.

The addition of powdered solids for mixing or reaction with paint and varnish vehicles can be a source of atmospheric dust pollution unless such materials are properly handled. Pulverized pigments may be carried through the exhaust system and discharged to the atmosphere if suitable controls are not used. The batch addition of other powdered materials such as phthalic anhydride to cooking kettles may produce a dust discharge of several minutes' duration even with a scrubber on the vent system.

Miscellaneous Sources

While the principal atmospheric pollution from a vehicle manufacturing plant results from the venting of cooking and mixing vats, there may be other minor sources of pollution within the plant, the importance of which will depend on the raw materials used, plant location, type of air pollution created and the seriousness of other sources. Factors such as spillage, leakage, or loss from vaporization of stored materials may make a greater contribution than casual observation would indicate. Each problem will require evaluation and solution on the basis of all the factors involved. An example of the extent to which control may be required is the case

Material	Concentration ppm.	Odor
Acrolein	1.8	Acrid odor
Crotonaldehyde	0.062	Eye and nose irritant
Acetaidehyde	0.066	Eye and nose irritant
Methyl methacrylate	1.0	Sickening sweet
N-butyl mercaptan	0.001	Skunk odor
Hydrogen sulfide	0.13	Foul (rotten eggs)
Ally sulfide	0.00014	Garlic odor
Sulfur Dioxide	1.0	Pungent

Table 3. Odor threshold concentrations.

of a plant using large quantities of methyl methacrylate; it is located in a semi-residential area and was at one time subjected to numerous complaints. After evaluating every possible source of odor, this plant has been forced to adopt special precautions at all stages of storage and handling, and now considers the spillage of ½ pint of the raw monomer a serious offense. Every precaution is taken against spillage and valve leakage. Special leak-proof connectors are used on the hose when emptying the tank truck into the storage tank. The saturated vapor exhausted from the raw monomer storage tank is vented through activated charcoal to prevent its escape to the atmosphere each time the tank is filled. Additional activated charcoal adsorbers are placed over the tank truck manhole opening and over the vent discharging from the monomer mixing room. Special instructions were furnished the supplier to insure delivery of the raw material in a tank truck free from odor and with all valves tightly closed against the slightest leakage.

Controlling Atmospheric Emissions

On the basis of experience gained through trial and error, several fairly good methods for the disposal of fumes from cooking operations have been developed. They are:

1. Condensation and absorption by scrubbing with water.
2. Condensation and absorption by scrubbing with alkali or acid washes.
3. Combustion.
4. Dispersal from high stacks.

No one control method has proved suitable for all applications. Many control devices now being used are, at best, only partially effective.

Fumes from cooking processes are composed of a heterogeneous mixture of gases, vapors, and particulates (both liquid and solid). Any one of these types of contaminants, by itself, might be effectively controlled by a single appropriate method. However, such a mixed composition does not lend itself well to highly effective control by any single method other than combustion. Although comparatively high fume removal efficiencies may be obtained with scrubbers in terms of the total mass of fumes collected, the bulk of material removed, may be innocuous water and easily condensed vapors, while those components having particularly objectionable odors may pass through the control device with much lower efficiency of removal.

A pilot plant study will often be worthwhile in determining the most effective and economical method of fume control for a given process, and may save costly or grossly inefficient installations. Considerable practical information regarding the composition and character of fumes from any process may be obtained by collecting samples with the apparatus described by Selheimer, et al (4) (5) (13), employing an air cooled condenser, a water condenser, a water or other liquid scrubber, dry ice-acetone condenser and activated carbon adsorption unit (Fig. 1).

Pilot plant studies will not predict every condition which will arise with the full scale unit. Allowance should be made for this possibility. An example of this is a catalytic combustion unit installed to operate at 750° F. Although the initial objectionable odor of the fumes was destroyed at this temperature, a secondary objectionable odor developed during combustion. A temperature of 950° F. in the catalytic unit was required to eliminate this secondary odor.

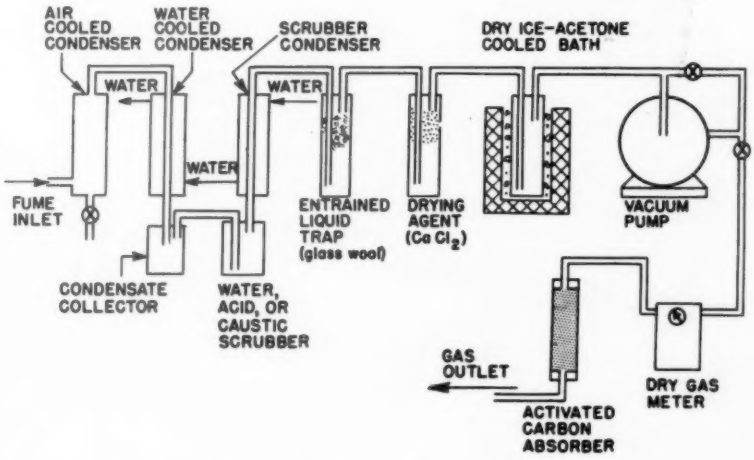

Figure 1. Fume sampling apparatus.

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DISTRIBUTION—A PHASE OF PRODUCTION

By
Lawrence Shatkin

DISTRIBUTION, in the broadest sense of the word, is the total of all operations involved in moving finished products from the place where they are made to the place where they are used. Across this spectra are involved the functions of transportation, warehousing, marketing, advertising, research, engineering, accounting and finance. It is a field of fertile growth, which should usher in the age of scientific mass distribution. It is not an isolated activity, but related to many aspects of the production cycle.

Relationship to Purchasing

The traffic manager's responsibility covers both extremes of the distribution pattern. He is responsible in securing the lowest possible costs for outgoing shipments, bearing in mind the requested delivery dates of his customers'. He assists the purchasing department in keeping incoming transportation costs at a minimum. This can be obtained through consolidation of materials purchased, joint purchasing, a change in carrier, re-routing of shipment, or consideration of the use of one's own truck.

Contribution to Production

In order to meet customers' delivery dates, many companies have modified their scheduling from a production completion date to a shipping date. This will afford greater flexibility for meeting contingencies that might arise. Some companies have taken this a step further by indicating two dates on their production forms. The first date indicates when the order must reach the shipping room, and the second notation denotes when the material must be delivered to the customer. This system is the introduction of a production control program within the shipping room.

Handling bags of pigment on skids allows for efficient warehousing.

The opinions expressed in this feature are not necessarily those of any particular firm or organization.

Supplementary gains should accrue through lowered packaging, handling and shipping costs.

Warehousing

Most warehousing problems must be solved outside the warehouse. The first step is an analysis of how a company's warehouses fit in—or don't fit in with the rest of the operations. Will it be primarily a storage area, or will it be called upon to perform final assembly and inspection, and pack products for shipment? In what condition will the material arrive? How often? What quantities will have to be handled? Your concept of what a warehouse is supposed to do will effect every phase of your warehouse planning. This includes finished goods as well as raw materials.

The physical distribution of goods encompassing traffic, warehousing and distribution should be a high management level responsibility. All activities that deal with the handling, storage, packaging and control over the movement of products in its various stages of manufacture should come under its jurisdiction.

Principles of Warehousing

1. Every square and cubic foot should be utilized.
2. Warehouse ceilings should be high—much higher than average.
3. Operation should be as completely mechanized as possible.
4. Small pallets usually afford optimum operation.
5. Order-pick lines should be employed throughout.
6. Ton-mileage principle should be used.

W. H. Maserole is the author of the ton-mileage principle. It is the application of a mathematical formula to save the order-pickers' time and effort. A picker spends about forty percent of his time actually selecting, loading, and marking his sheet. He spends the rest of the time moving from stop to stop.

The fastest moving items are assigned to bins and racks nearest the loading docks. The heaviest and bulkiest items are also near loading platforms. This way, the order-picker has to move the most tonnage the fewest miles per day. Since fast movers are all grouped together at the end of the line, and slow movers at the beginning, the pickers can frequently skip aisles, push a light load most of the way, and add heavy weights in the last aisle or so.

Integrating Materials Handling

As mentioned previosuly physical distribution of goods would cover material handling, warehousing, layout, packing, traffic and control of materials. This concept of looking at the "whole" will encourage lateral communication and coordination.

The displacement of trailer loads of pigment is time-consuming and costly. It can be handled in the conventional manner whereby the material is arranged on skids as the trailer is being unloaded at the customer's plant. A simple, yet substantial improvement can be worked out with the cooperation of the supplier. By previous arrangement, the supplier retains a given number of his customers' skids at his warehouse. Upon receipt of an order, the pigment is loaded on the skids and shipped. It then becomes a simple matter of hoisting the laden skids and returning an equal number of empty platforms for a subsequent shipment. This will decrease the material handling time by more than fifty percent, and certainly eliminate what was considered a strenuous job. A small change in thinking made a major change in handling, which has coordinated the functions of distribution and saved money. Such an integrated program will raise productivity and improve service, even though no money is spent on new equipment or facilities.

Pallet load of paint from storage shelf is being brought to shipping area for distribution.

Automation

Conveyorizing has been the accepted method of moving goods continuously from one fixed location to another.

The essential change that has taken place in the material handling picture is the reality today of control equipment—capable of acceptance, and if necessary, of memorizing instructions and making decisions and then transmitting the proper impulses to mechanical equipment as required.

To fulfill the basic function in warehousing requires, essentially, two types of control equipment. Both of these have been fully developed, but as yet they have not been widely used. One of these types provide for the automatic sorting of material; the other, for the automatic selection and discharge of material. With these innovations, it is reasonable to expect a minimum saving of fifty percent of direct labor cost.

Economic Concepts of Distribution

The problem of distribution has become more important as we moved from an economy of scarcity to one of abundance. As society becomes wealthier, this problem becomes more complex. Distribution becomes the mid-way point between production and consumption.

Distribution deals with the objects of economic importance; it deals with means of production, and has to be viewed objectively. If distribution is recognized, as it should be, as an integral part of the production process, there would be no doubt of its productivity in an economic sense.

Distribution is not exact. It can't be. It includes the whole realm of marketing and so is subject to the ill-defined and unpredictable tides of our economy. It is changed by daily headlines in the newspapers. We must put scientific principles to work in distribution, but we must also remain flexible enough to change with changing times.

NEW FROM CONTINENTAL

Electrically welded, leakproof flaring pails

nest to save storage and shipping costs!

9,000 vs. 3,000

A boxcar holds 3 times as many flaring as straight-sided pails. Same 5-gal. capacity!

Single seam construction

gives leakproof protection for hard-to-hold products

Continental's new flaring pails are ideal for liquid roofing cements, paint and petroleum products, dry or powdered materials. Ask your Continental man for details.

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CUBAN OFFICE:
Apartado #1709, Havana

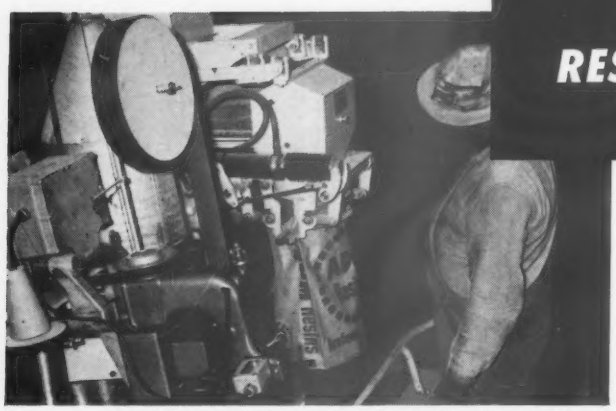
Meet Erik Aberg— He helps make ADM "Easy to Buy from"

● Marine Corps Intelligence lost a whole platoon of skills when Erik Aberg became a civilian at ADM. Relaxing at home with his Pensacola-born wife, Erik enjoys painting with oils, sketching clever cartoons to amuse the youngsters, or working on numerous home-improvement projects. With equal facility on the job, Erik applies his many talents to instrument or mechanical problems.

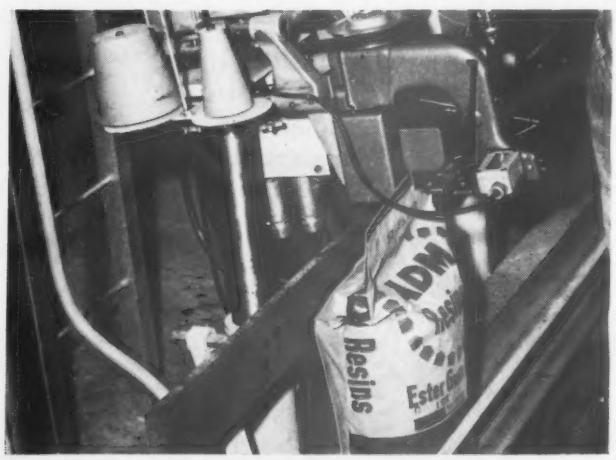
That's why the "situation is well in hand" at ADM's Pensacola resin plant, where Erik is mechanical supervisor. It takes multiple skills to keep ADM in front with the latest and best in resin products and services.

Like men in five other ADM resin plants, Erik has these skills, and more. Though a "show me" boy from Missouri, Erik's military training prompts him to say "I'll show *you*." Then he sketches another original production idea, such as the new operation at Pensacola that bags ready-crushed nuggets of hard resins. Erik designed it. Erik supervised its installation. Here's how it saves you time and trouble.

ADM RESI NEWS



3 Result is a practical new way to handle nuggets of hard resin — in a convenient, uniform-weight package. Free flowing resin nuggets, about the size of ping-pong balls, can be conveniently used for any size batch. By using ADM bagged resins, you'll find it easier to obtain the correct material balance in your formulations.



4 The resin bags are automatically taped and sewed. These tightly sealed, vapor barrier lined bags prevent moisture pickup or contamination during storage. You can be positive that when ADM hard resins reach your plant, they are easy to handle and ready to use.

5 For easy palletizing, ADM resin bags have a "Ruf-Grip" outer shell which keeps the bag securely in place when stacked. Bold, bright printing makes the bags easy to classify and spot in the warehouse.

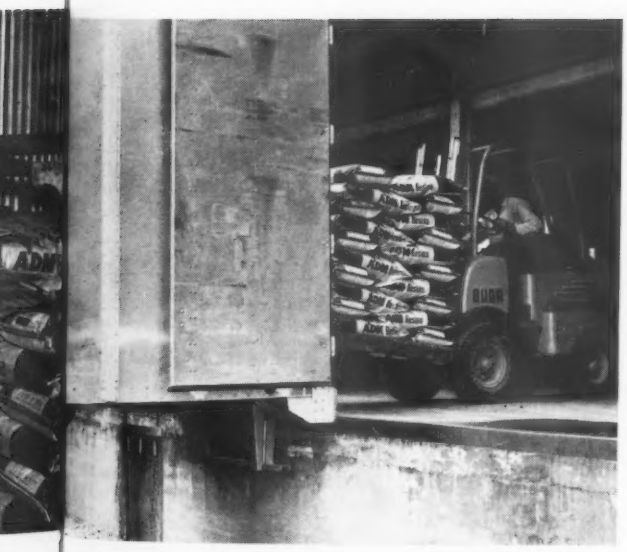
6

1

What does it take to bag hard resins? Away to the drawing board and get those ideas down on paper — crushing techniques, optimum size, flow characteristics, moisture barrier. Out of it comes a simplified plan for greater service to users of ADM hard resins.

2

Final installation works as smoothly as designs and preliminary tests indicated. A gravity flow system minimizes the amount of air occluded "fines" or flakes in the nugget-sized bagged resins. This increases ready solubility in either cold cut or hot melt varnishes. The product flows vertically from the crusher at the top to the bagging hopper below and is automatically weighed into tough, multiwall 50-pound bags.



Easy-to-handle ADM bagged resins save time, labor and storage space. The smooth inner liner empties clean, with no waste. Try ADM hard resins in this new nugget form. Products available are Ester Gum C, Arochem 520 and 545, and Arofene 753 and 775. Other hard resin products in quantity bagged on request.

Providing hard resin nuggets in bagged form is just one example of the numerous services which ADM offers to industry. Other ADM services include: Research and development that support and supplement the findings of your own laboratories . . . extra service of specially trained technical field men . . . ADM's quality control laboratories that assure you accurate product specifications . . . prompt delivery from a nationwide network of plants and warehouses . . . versatile, quality products for streamlined, *profitable* inventories.

Erik Aberg and other ADM specialists make products noted for quality — preferred for results. This is what makes ADM *Easy to Buy From.*

Archer-Daniels-Midland

RESIN and PLASTICS DIVISION

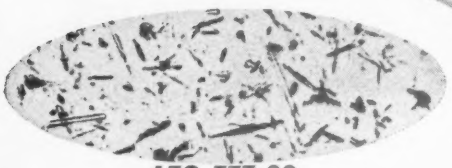
729 Investors Building • Minneapolis 2, Minnesota

ADM PRODUCTS: Linseed, Soybean and Marine Oils, Synthetic and Natural Resins, Fatty Acids and Alcohols, Vinyl Plasticizers, Hydrogenated Glycerides, Sperm Oil, Foundry Binders, Bentonite, Industrial Cereal, Vegetable Proteins, Wheat Flour, Dehydrated Alfalfa, Livestock and Poultry Feeds.

High Apparent Density, De-aerated

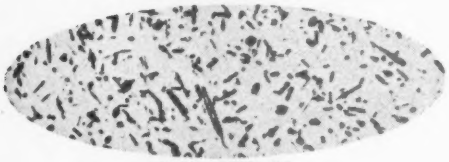
AZODOX

Available in all AZO paint grades of American Process zinc oxides.



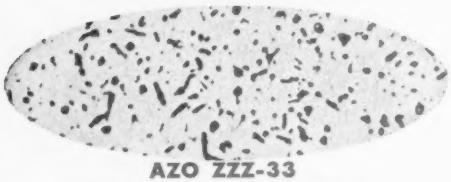
AZO ZZZ-22

for high consistency in paints



AZO ZZZ-11

for medium consistency in paints



AZO ZZZ-33

for low consistency in paints

AZO acicular zinc oxides are free from detrimental colloidal fines, produce exceptional weathering properties in exterior paints, and are resistant to hard settling during shelf storage. For general use in the production of paints and enamels.

1ST

American Zinc was the first, *and is still the only* producer of acicular lead-free zinc oxides covering a wide range of oil absorptions from high to low *and including the intermediate ranges.*

AZODOX has twice the apparent density, half the dry bulk. Cuts storage space in half. Except for density, all physical properties are unchanged. And all chemical properties are unaltered. AZODOX saves you money in handling, storing, mixing, grinding. Costs no more than conventional zinc oxides.

AZO acicular zinc oxides (AZODOX or conventional) are recommended for the extra durability, the finer weathering qualities they give to paint. Available in a wide range of oil absorptions to meet your requirements.

American Zinc sales company

Distributors for AMERICAN ZINC, LEAD & SMELTING COMPANY

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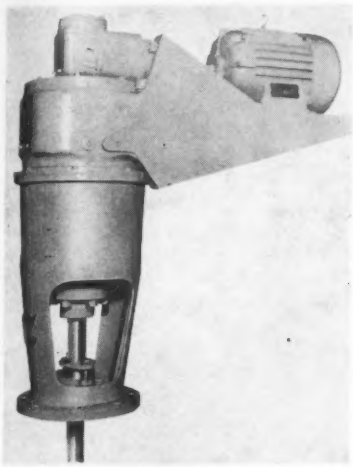
NEW EQUIPMENT AND MATERIALS

This section is intended to keep our readers informed of new materials and equipment. While every effort is made to include only reputable products, their presence here does not constitute an official endorsement.



CHEMINEER

TURBINE AGITATORS

Features Wide Flexibility

Said to feature flexibility in meeting a wide variety of process requirements from inventoried modular components, the Moduflex line of turbine agitators has been developed.

Five basic gear-drive configurations are available in sizes through 75 hp.: right angle head, belt driven, in-line with coupled motor, in-line with integral motor and variable speed.

Gears in Moduflex drives are flame-hardened chrome-moly steel with teeth ground after hardening for quiet operation. To prevent harmful dynamic deflection, the shaft has a generous cross section and is rigidly supported by closely spaced spherical and tapered roller bearings. This design improves critical frequency to the point that standard Moduflex agitators can be used for most applications which formerly required steady bearings.

Lubrication of all moving parts in the gear case is provided by a positive oil pump. A dry-well seal prevents leakage.

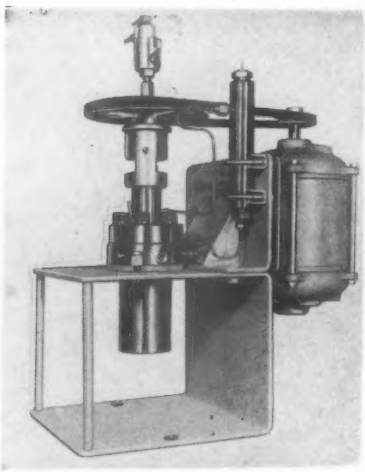
In addition to choice of material for wetted parts, three standard impeller styles are offered: straight blade, curved blade, and 45° pitched blade.

Chemineer, Inc. EM-1.

AUTOCLAVE

Bench Scale Research

A new autoclave designed for bench-scale research is now being manufactured.



PRESSURE PRODUCTS

The new 300 ml., 5,000 p.s.i.g., stirred reactor together with its stand and motor is only 26 inches high and requires a 20 x 12 inch space. It can be mounted on the floor, a bench, or the wall.

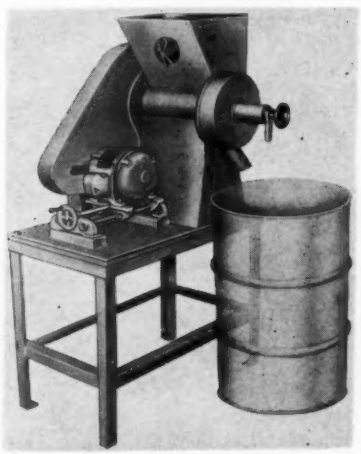
The P. P. I. stirrer shaft is water cooled and is guaranteed for 500 hours operation. Shaft speeds of up to 1,500 r. p. m. can be used. An outstanding feature is a special intensifying lubrication cylinder which can be used with either oil or water. The reactor can be furnished with any of the following types of stirrers: marine propeller, turbine, paddle or gas dispersing (Gasperator).

Other features include: a new spiral grooved jacket for rapid heating and cooling, which can be used with or without an electric heating mantle (standard electric heating can also be supplied); the simple, flat bolted closure has a fully confined, spiral wound gasket; the body flange can be provided with up to six openings, including the ½" rupture assembly—this makes it unnecessary to disconnect tubing when removing cover; the reactor body is securely held to the mounting stand by two readily accessible bolts.

The standard motor furnished with the unit is a one-half horsepower, 110/220 volt, single phase, Class I, Group D.

Pressure Products Industries, Inc. EM-2.

To obtain further information on the product items presented in this section, use the handy Readers' Information Service Coupon on page 79.



CHARLES ROSS

PULVERIZER

Revolving Crushing Roll

A heavy duty dry crusher or pulverizer has been added to the dry ginding equipment manufactured by the company.

NEW MATERIALS — EQUIPMENT

This machine, the #70-H size 4 Crusher, incorporates a revolving crushing roll inside the hopper to give material a preliminary breaking down before feeding between special hardened steel grinding plates. Clearance of plates and fineness of grind are simply adjusted by handwheel, and when desired fineness is obtained, setting can be locked and material kept feeding through.

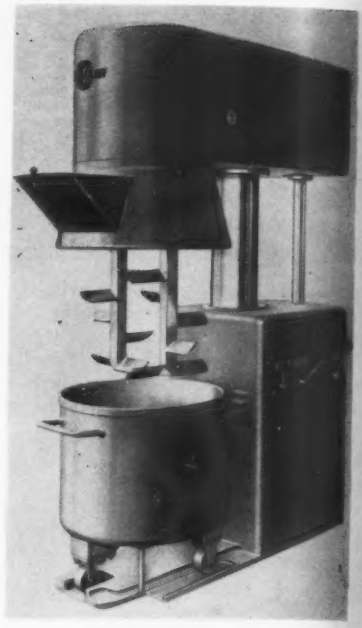
The crushers feature variable speed drive as standard equipment which is said to deliver best results with maximum production. Indicating gauge insures precise control of fineness of grind. The #70-H size 4 Crusher can be readily dismantled and cleaned within two or three minutes.

Charles Ross & Son Co. EM-3.

MIXER/KNEADER
Wide Range of Materials

A planetary mixing and kneading machine is now offered.

The new mixer processes a wide range of materials highly fluid, viscous or pasty in consistency. An unusually efficient planetary action is claimed by the manufacturer. Two mixing spindles equipped with helically arranged vanes move along the tank wall while rotating at high speed around their own axes. The mixing mechanism



J. M. LEHMANN

is raised and lowered automatically.

The machine has a new kind of tank speed arresting mechanism. Swivel, tilting, runout, or stationary tanks are provided in capacities from 1 to 350 gallons. The use of several tanks permits almost continuous production.

This mixer is available in several types and power specifications. The shapes and materials of the mixing tools and tanks can be varied according to requirements; stainless steel, bronze, light metals, nickel are obtainable, and also plating with tin, copper, nickel, etc. If heating or cooling are required in the mixing process, double wall tanks can be furnished. Explosion-proof motor and switches are also available.

J. M. Lehmann Co. EM-4

DRUM TAP
3-Slide Cutoff

A dripless retracting drum tap that employs a 3-slide guillotine cutoff to assure positive, drip-free operation has been announced.

Available for installation by the drum maker or by the processor at time of filling, the new tap is ready for instant use by the consignee. This is said to eliminate wasted time presently required by the user to reverse conventional drum spigots from storing to pouring position.

PROFIT MARGINS INCREASE . . .

WHEN THE BEST MIXER IS USED FOR EACH APPLICATION

There is only one Mixer that is the most efficient for each different mixing requirement — let us recommend the best Mixer for your use based on our wide variety of types and almost a century of experience.

- 1 Pint — 5000 gallon sizes.
- Standard designs, or with any modifications required.
- Also Three Roller Mills, Dry Grinding Mills, and other types of Mixing, Grinding and Dispersing Equipment.

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Write for complete information!

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Leading mfgrs. of wet or dry grinding Mills, Kneaders and Mixers of all types—since 1869

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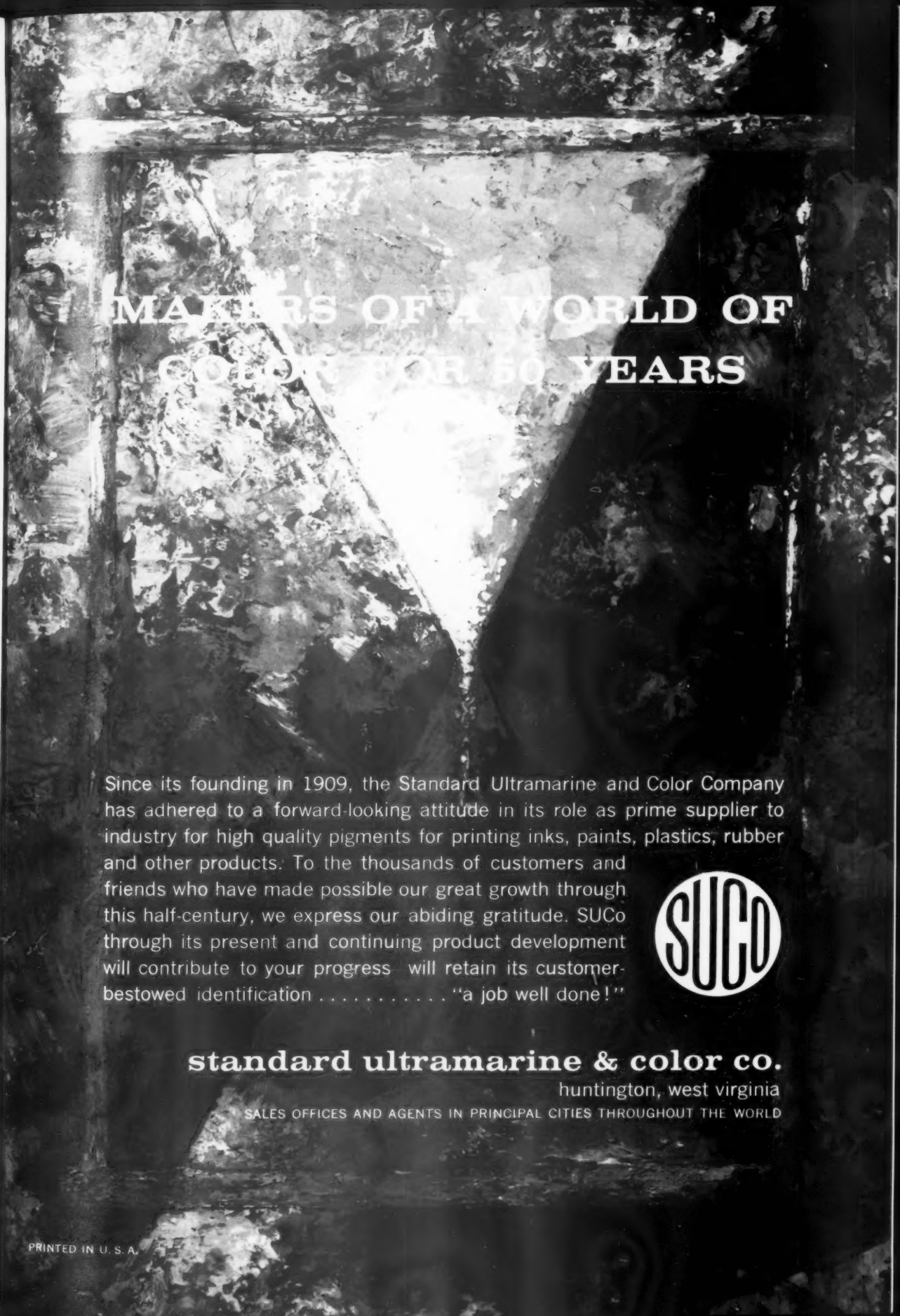
MAKERS OF A WORLD OF
COLOR FOR 50 YEARS
Since its founding in 1909, the Standard Ultramarine and Color Company has adhered to a forward-looking attitude in its role as prime supplier to industry for high quality pigments for printing inks, paints, plastics, rubber and other products. To the thousands of customers and friends who have made possible our great growth through this half-century, we express our abiding gratitude. SUCo through its present and continuing product development will contribute to your progress will retain its customer-bestowed identification . . . . . "a job well done!"
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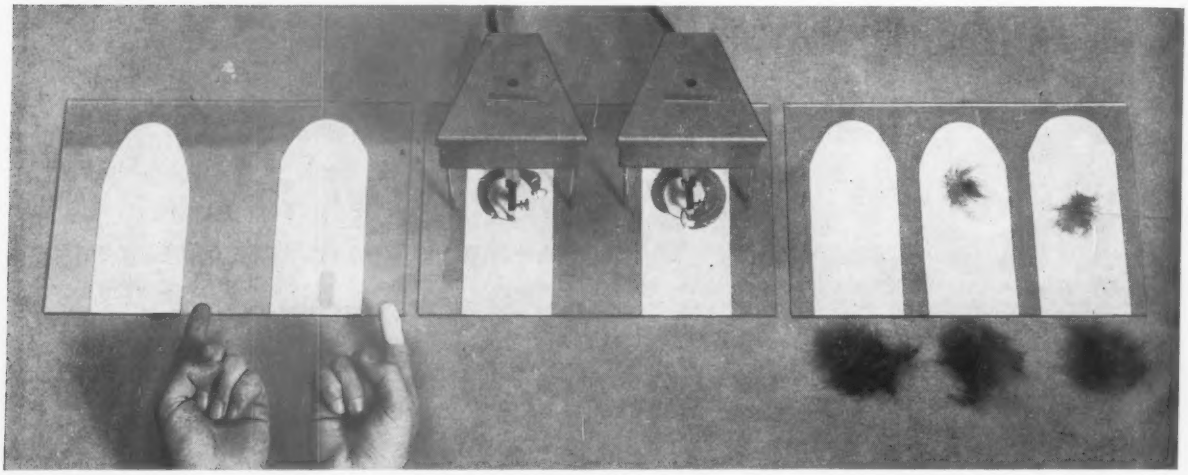
UNTIL YOU TEST IT YOU WON'T BELIEVE IT

Your formula with PVO Process Safflower Oil in very long oil isophthalic alkyds produces a virtually perfect house paint!



FINGER TEST... Left Drawdown – Safflower – IPA base ... Right Drawdown – Tall F. A. – IPA base

DRY TIME RECORD – 24 hour cycle ... Left Drawdown – Safflower – IPA base ... Right Drawdown – Linseed – IPA base

COTTON PUFF TEST... Left Drawdown – Safflower – IPA base ... Center Drawdown – Tall – F.A. – IPA base ... Right Drawdown – Linseed – IPA base

By test—finger, circular dry-time recorder and cotton puff—all these tests prove that Safflower Oil in the isophthalic alkyd produces a coating with the fastest initial-dry, best through-dry, and least after-tack.

Fastest initial-dry — proved by time-honored finger test. This average 3-5 hour set up is slow enough to prevent lapping troubles, speedy enough to diminish dust and insect collection.

Very best through-dry time — Safflower-isophthalic has the best through-dry of any isophthalic house covering—proved by circular dry-time recorder: 17 against 24 to 48 hours! With no tendency to skin-dry, the product with Safflower resin is hard, tough—not subject to mar damage, wrinkling or uneven drying stresses.

After-tack? — practically none. Cotton puffs lightly touched to 6 hour old plates demonstrate the complete dry quality of Safflower — isophthalic house paint.

SUMMARY: These advantages of Safflower in long oil isophthalic alkyds, tested and proved, allow manufacturers to produce top-quality coatings. Add to them non-yellowing characteristics, high gloss retention, color integrity, and you have a product with a record of tests that prove *Safflower is your best buy.*

Our brochure with new formulas and data will be sent on request.

SAFFLOWER OIL by PVO Process

PACIFIC VEGETABLE OIL CORP.

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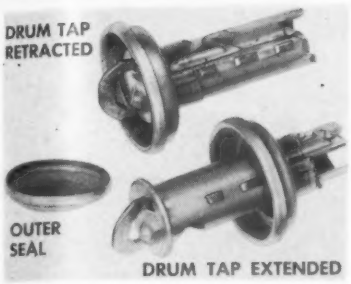
NEW MATERIALS — EQUIPMENT



HADCO

The tap is opened by a slight turn and pulling. In extended position, liquid flows freely through a full-opening pouring port in the tap. Shut-off is accomplished by pushing the tap back into the drum and turning clockwise to locked position. Dripping or leaking is not possible in this position. In "off" position, the unit is flush with the drum head so that no projection exists to cause accidents, the manufacturer points out. As the spout is positively dripless, a cleaner, safer, more sanitary drum rack area is assured.

The tap is available in two models. One style can be embossed into the head by the drum manufacturer. A threaded model that fits standard ¾" pipe-size drum openings is available for installation by the processor during the filling operation, placing it in the ¾" bung for the convenience of his customers. In either instance, the retracting tap is claimed to eliminate need for conventional cast iron spigots ordinarily shipped inside the drum.

Hadco Corporation. EM-5.

PEARL PIGMENT
Yellow or Bluish Tone

Nacromer Z, a new synthetic pearl pigment, said to have greater brilliance than the best grades of natural pearl essence, has been made available.

In concentrated paste form, Nacromer Z is available in formulations for use with nitrocellulose, ethycellulose, vinyl lacquer, and most other coating vehicles. Applied by brush, spray, or dip to wood, metal, plastic, glass, leather, paper, and many other materials. No additional equipment or finishing operations are required for applying a Nacromer Z coating.

In addition to simulating natural pearl effects, it is possible to obtain an almost unlimited range of lustrous effects with Nacromer Z by adding transparent pigments or dyes. Because it provides greater coverage, Nacromer Z may be used at proportions 30% less than usual for other pearl pigments, thus providing greater economy.

Nacromer Z is available in two categories: "A" with a faintly yellow tone, and "B" with a faintly bluish tone. These color variations are not intense colors but are subtle shadings of the usual "silvery" pearlescent character.

The Mearl Corporation. EM-6.

MARINE OIL
Variety of Uses

A new product, Marine Oil WC, is now available.

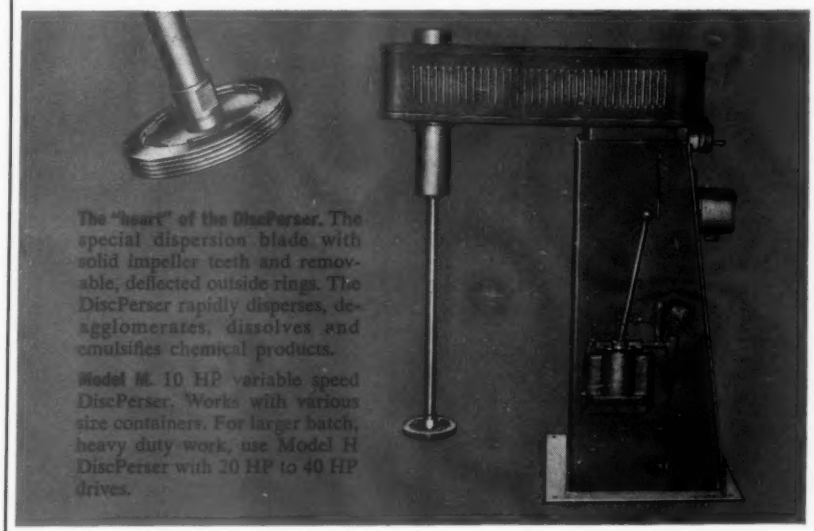
It is recommended by the manufacturer where raw material cost is the prime factor. Said to be more economical to use than tall oil fatty acid.

The specifications are: Iodine Value—180 Min., 200 Max.; Acid Number—10; Color—Dark; Solids—100%; Dry—Excellent.

T. F. McAdam, Inc. EM-7.

ORGANIC ACID
High Boiling Point

The availability of *iso*-decanoic acid (mixed isomers) in commercial quantities has been announced.


The "heart" of the DiscPerser. The special dispersion blade, with solid impeller teeth and removable, deflected outside rings. The DiscPerser rapidly disperses, deagglomerates, dissolves and emulsifies chemical products.
Model M. 10 HP variable speed DiscPerser. Works with various size containers. For larger batch, heavy duty work, use Model H DiscPerser with 20 HP to 40 HP drives.

NOW! A finished dispersion in a single operation!

The new HOCKMEYER DiscPerser . . . produces very rapid ultimate dispersion...handles high-viscosity materials!

The DiscPerser's special blade operates at peripheral speeds in excess of 6000 FPM. The solid impeller teeth shred and break up pigment agglomerates. Material is discharged through the slots between the rings, at great speed and under intense hydraulic pressure. Tremendous fluid hammer action is developed by the smashing of material against the surfaces of these deflected outside rings. Material leaves the blade in thin, high-speed jet streams. Impact on the slower moving surrounding material creates further attrition and speeds the breakdown to original pigment particle size.

Versatile, the HOCKMEYER DiscPerser also: ● Cold cuts and dissolves exceptionally fast. ● Tints and lets-down unusually efficiently. ● Pre-mixes heavy bases for mill equipment; greatly increases the milling operation.

TRY IT AT OUR EXPENSE. The HOCKMEYER DiscPerser can increase your production, improve your product, save you money. Try it *free* in your own plant. Write for details and free descriptive folder. *Act now!*

HERMAN HOCKMEYER & CO.
341 Coster St., New York 59, N. Y.

Herman Hockmeyer and Co.
341 Coster St., New York 59, N. Y.

For details of how you can try the HOCKMEYER DiscPerser *free* in your plant and for a free, illustrated DiscPerser folder, clip this coupon . . . mail it today! PVP-99

*My Name*_____

*Company*_____

*Address*_____

*City*_____ *Zone*____ *State*_____

The new acid is a complex mixture of methyl-substituted, ten-carbon, aliphatic, monocarboxylic acids having relatively little alpha substitution. The principal isomers are trimethylheptanoic and dimethyloctanoic acids.

The acid has a high boiling point, and is soluble in organic solvents, but not in water. It will react to form salts, esters, amides, amines, etc. Because of its chemical nature, it has potential applications similar to those of coconut fatty acids (caprylic, capric, and lauric) and tall oil-derived fatty acid (pelargonic). Being a primary product, *iso*-decanoic acid is free from fluctuating supply and price.

Potential applications for the acid or its derivatives include: driers for varnishes and enamels, plasticizers and stabilizers for polyvinyl chloride resins, alkyd resin modifiers for nitrocellulose automotive lacquers and alkyd-amine resin applicance finishes, and boiler feed-water defoamers.

Union Carbide Chemicals Co. EM-8.

STABILIZER & THICKENER

Wide Variety of Applications

The commercial introduction of a new chemical, with unusual properties that suggest its use in a wide variety of applications, has been announced.

This new product, "Natrosol 250," is a water-soluble stabilizer and thickener. Extensive development work suggests its application in water-based emulsion paints, preparation of polyvinyl acetate emulsions, and latex emulsions for adhesives and coatings.

Natrosol is a nonionic water-soluble hydroxyethyl ether of cellulose, available in four viscosity types. One of its unique properties is that one viscosity type is said to be the highest available for this type of chemical, an advantage which suggests Natrosol as the most efficient thickener among nonionic cellulosics.

Other advantages claimed of Natrosol 250 include its ability to produce unusually clear, smooth, sparkling solutions with no haze or color, and its availability in granular form in order to minimize dusting and lumping during handling, as well as to improve dispersibility upon addition to water.

The highest viscosity type possesses a viscosity in excess of 20,000 cps. at 2% concentration. This material is useful for thickening and stabilizing all types of aqueous systems, and is relatively unaffected by the presence of salts, acids, or alkalies in solution. Excellent compatibility with gums and latices renders it a preferred thickener in water-based emulsion paints and latex emulsions for adhesives and coatings.

The low-viscosity types are used as polymerization stabilizers in the preparation of vinyl acetate homopolymers and copolymers.

Hercules Powder Co. EM-9.

PUMP

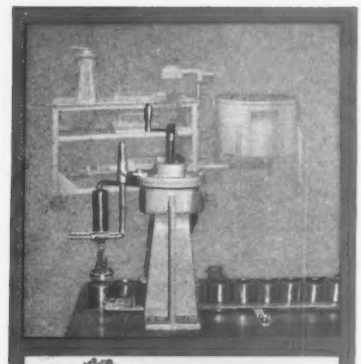
9 Moving Parts

A new pump claimed to be completely different in principle and design from any now in existence, will pump anything that flows according to the manufacturer.

The Crossley Free-Piston Pump has only 9 moving parts.

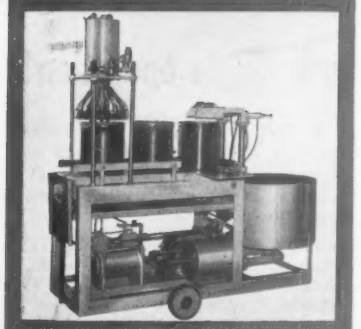
The pump impels a continuous air-free flow without pulsating or surging. It requires no safety or relief valves; when a stoppage occurs, the pump stops. It can be operated with complete safety and efficiency submerged, or under any condition. There are no motors or engines, drive shafts, packings, seals, oils or greases.

SPEED OUTPUT... CUT COSTS
with these Time-Tested Portable
FILLING and SEALING MACHINES



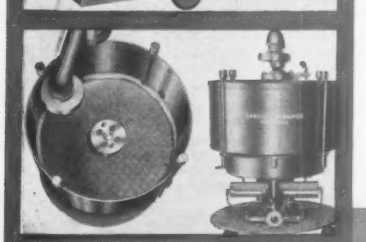
MODEL PF-9C
FILLS, SEALS, COUNTS, CODES

With this air-operated, portable machine, ONE OPERATOR seals, fills, counts and codes HALF-PINTS 30 to 35 a minute. PINTS or QUARTS 25 to 30 per minute. ½-GALLONS, 18 to 20; GALLONS, 16 to 18. No materials wasted. Accurate No-Drip Nozzle delivers a clean package. Used by major Paint manufacturers. (U.S.A. and Foreign).



MODEL DPF 5-1
COMBINATION FILLER and SEALER of LUG or RING-TYPE PAILS

This duplex air-operated unit fills and seals PER MINUTE 6 to 8 *FIVE*-GALLON PAILS —8 to 12 *TWO*-GALLON PAILS—14 to 16 *ONE*-GALLON (depending on viscosity of product). It stops the waste of old-fashioned handling of heavy containers with SAFE, CLEAN, ACCURATE production methods. Needs only one man and 60 lbs. plant air. Endorsed by leading Paint Manufacturers.



MODEL PSM-2
SELF-CLEANING, HIGH-PRODUCTION STRAINER

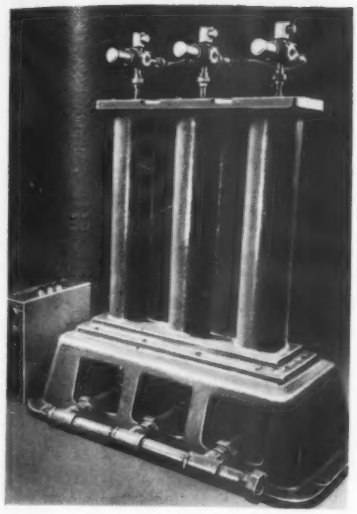
Constructed of non-corrosive metals throughout, this portable Self-Cleaning Strainer has INTERCHANGEABLE SCREENS 10 to 250 mesh. Built for lasting heavy-duty production, it cleans high viscosity fluids 30 GALLONS A MINUTE. Gearless, safety air-powered. An evolution in paint-straining equipment for all Paint, Varnish and Lacquer Manufacturers or Processors of industrial, chemical, or food oils and fluids.

Write to Dept. PV-9

C. M. AMBROSE CO.
4416 WHITE BUILDING
SEATTLE 1, WASH.

Since 1935

NEW
MATERIALS — EQUIPMENT



CROSSLEY

The pump is operated by compressed air which is introduced into each cylinder in sequence; while the left cylinder is discharging, the center cylinder has filled and is waiting, and the right is filling. Chambers fill by gravity. In each chamber is a nylon free floating piston and two nylon ball valves. Operation is automatically controlled by a separate control box. Because one chamber can be stopped while the other two continue to function, the pump can operate indefinitely without being shutdown. The pump can be made in any size desired.

Crossley Machine Co. EM-10.

LIQUID LEVEL DETECTOR
Uses Nuclear Radiation

Said to meet the need for extreme simplicity and ruggedness, the Model GM-7 Gamma-switch is used with a source of radioactive material to provide high and/or low level alarm actuation without contacting the material in the tank or vessel.

Standard Gamma-switch consists of an "infinite life" Geiger-Mueller tube which detects gamma radiation and through a transisterized integrating circuit applies voltage to a thyratron relay grid. The thyratron actuates an "on-off" adjustable limit latching relay to operate alarms of various kinds.

Switch components are sealed in a 4½" diameter schedule 40 carbon steel explosion proof enclosure. Length is 21"; weight is 30 lbs. Power required is 115 V.A.C., 60 cycles, 0.5 amp.

Where both high and low signals are required two Gamma-switches may be used with a single source where vessel diameter does not exceed the desired range of level measurement. For greater ranges two sources and two Model GM-7 Gamma-switches are generally used. For control use, a single Model GM-7 may be adjusted to provide "on-off" signals in a range from 1/8" to 3".

Radium, cesium-137 or cobalt-60 are the source of radiation energy and are sealed in a lead shielder holder equipped with a locking shutter. Safety from radiation is provided during shipping, installation and maintenance, as well as in use.

The Ohmart Corp. EM-11.

BALANCE
Simple Graduated Dial

Weighings, it is claimed, now can be made in 1/3 of the time with a new dial balance. Its capacity is 500 grams.

The new design features a simple graduated dial which can be turned without arresting the oil-damped balance, replacing the time-consuming "cut-and-try" procedure necessary with graduated beam and slide weight of conventional balances. This means that the

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READERS' SERVICE SEPT. 1959

To obtain further information on the new raw materials and equipment covered in this section, simply mark reverse side, clip coupon, fold, and mail.

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time-consuming portion of the weighing (below ten grams) literally can be "dialed in" in 1/3 the time.

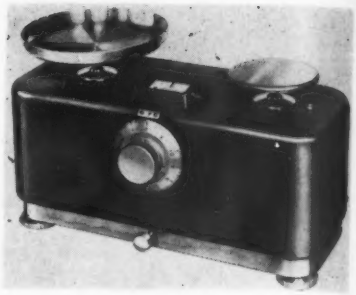
The new dial mechanism retains its original accuracy after more than a million weighings. The firm has unconditionally guaranteed the new dial mechanism.

Previously most conventional laboratory balances used a graduated beam and slide weight for "fine" weighing after the weight had been determined within 10 grams. Under the old procedure the balance is arrested, slide weight positioned, balance released, balance comes to rest, position of indicator noted, balance arrested again, slide weight repositioned and so on until the weight is determined within 0.1 gram.

The new dial is graduated from zero to 10 grams by one-tenth gram (0.1) graduations. The dial is readable to 0.02 gram. The balance is oil-damped to minimize oscillation and greatly facilitates the weighing operation.

The metal case has a corrosion resistant gray finish constructed to exclude dust and chemicals. The unit measures 11¾ x 6 x 6¾ inches.

The Torsion Balance Company. EM-12



TORSION BALANCE

FATTY NITROGEN
Versatile Intermediates

The commercial availability of 24 new fatty nitrogen chemicals have been announced.

The new products include four primary, five secondary, and three tertiary fatty amines (trademarked Alamines); four fatty trimethyl ammonium chlorides, five difatty dimethyl ammonium chlorides, one trifatty methyl ammonium chloride, and two quaternized fatty diamines.

The new chemicals are said to be versatile chemical intermediates possessing properties such as solubility in a wide variety of polar and non-polar solvents, surface activity, base exchange, and anti-static activity.

General Mills. EM-13.

VINYL PAINT
Interior/Exterior Masonry

A new vinyl masonry paint that does not require pre-wetting of porous masonry surfaces has been announced.

The paint is made for exterior or interior masonry surfaces and may also be used as a stipple paint.

The new paint contains Polyvinylacetate, cement, pigments and other additives that act as built-in surface conditioners.

Besides eliminating pre-wetting requirements, the new paint, it is claimed, has been proven to have greatly increased hiding ability. Where two or more coats of paint had been necessary in the past, one coat of this new paint will often cover masonry equally well.

Mixed with water the paint can be directly applied with brush, roller, or paint sprayer. Named Hylite Instant Vinyl Masonry Paint, it is available in white and in a number of modern colors.

Carbola Chemical Co. EM-14.

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READERS' SERVICE

Use this handy self mailer to obtain further information on the new raw materials and equipment discussed in this section.

Check desired items below; write name and address on reverse side; and mail.

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Items

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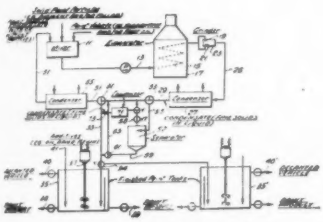
☐ EM-4	☐ EM-11
☐ EM-5	☐ EM-12
☐ EM-6	☐ EM-13
☐ EM-7	☐ EM-14

PATENTS

Complete copies of any patents or trade-mark registration reported below may be obtained by sending 50c for each copy desired (to foreign countries $1.00 per copy) to the publisher.

Method for Manufacturing Paint

U. S. Patent 2,885,298. Du Bois Eastman, Whittier, Calif., assignor to The Texas Co., New York, N. Y., a corporation of Delaware.



U. S. Patent No. 2,885,298

A method for manufacturing paint comprising mixing relatively coarse particles of solid paint ingredients with a vaporizable liquid having a relatively low boiling temperature and a relatively higher boiling paint oil in proportions to form a fluid mixture; passing said fluid mixture in a stream through a vaporization zone; heating said fluid mixture to a temperature above the boiling temperature of said vaporizable liquid but below the boiling temperature of said paint oil and forming a flowing dispersion of solid particles and paint oil particles suspended in vapor, said paint oil acting to coat particles of said paint ingredients in said dispersion and render said particles readily wettable by and dispersible in paint vehicle; reducing the size of said solid particles by subjecting said flowing dispersion to turbulence and high velocity; and combining the resulting oil coated particles of reduced size with liquid paint vehicle to form a paint.

Bituminous Coating

U. S. Patent 2,886,459. Joseph Leopold Lajoie, Vaudreuil, Quebec, Canada, assignor to The Patent and Licensing Corp., New York, N. Y., a corporation of Massachusetts.

A coating composition comprising a bituminous binder, a solvent thinner, aluminum flakes, mineral fiber, mineral powder filler and red iron oxide pigment, the aluminum flakes being present in amounts to impart to the films formed from the composition a metallic appearance, the color of which is governed by the relative amounts of said pigment and said aluminum flakes, the amount of the solvent present in the composition being substantially less than the combined weight of the bituminous binder, aluminum flakes and mineral fiber present therein, and the aluminum flakes constituting approximately 10 to 12 percent by weight of the total solids of the composition.

Isocyanate Paint

U. S. Patent 2,886,455. Roger H. Doggett, Natick, and Alfred R. Johnson, Stoneham, Mass., assignors to Arthur D. Little, Inc., Cambridge, Mass., a corporation of Massachusetts.

A paint composition consisting essentially of a pigment, a drying oil, mineral spirits, a drier, and an isocyanate, said isocyanate being selected from the group consisting of hydrocarbon monoisocyanates and hydrocarbon monoisothiocyanates the hydrocarbon radical of which contains at least 12 and not more than 18 carbon atoms and reaction products thereof with ethylene imine, said isocyanate constituting between one and 20 percent of the vehicle of said composition.

Preserving Gloss in Paint Film

U. S. Patent 2,886,456. Maurice Van Loo, Chicago, Ill., and Verner W. Bitter, Winlock, Wash., assignors to The Sherwin-Williams Co., Cleveland, Ohio, a corporation of Ohio.

The method of preventing flatting of partially dry glossy air drying essentially anhydrous solid film-forming coatings by droplets of water condensed from the ambient atmosphere comprising adding to an air drying anhydrous coating composition having a PVC less than the CPVC for the system from about 0.5%

RAYOX
Titanium Dioxide

NYTAL
Magnesium Silicate

PYRAX
Ground Pyrophyllite

PEERLESS CLAY
Domestic China Clay

THERMATOMIC BLACK
Low oil absorption Black

RHEOTOL
For leveling and Gloss

ACTIV-8
For Stabilization and Acceleration of Drying

NORVAN
Polyvinyl Acetate Emulsion

VANCIDE
Fungicide

DARVAN
Dispersing Agent

R. T. VANDERBILT CO. INC.
230 PARK AVENUE
NEW YORK 17, N. Y.

to about 2% by weight of the coating composition of a water-soluble sulphonate of di-saturated aliphatic hydrocarbon ester of succinic acid in which the aliphatic group contains from 5 to 15 carbon atoms.

Coating Composition Vehicles

U. S. Patent 2,891,919. Roger M. Christenson, Whitefish Bay, and Robert F. Borman, Milwaukee, Wis., assignors to Pittsburgh Plate Glass Company.

A method of preparing a product useful as a vehicle in coating compositions, which comprises substantially completely esterifying an acidulated soap stock with a polyhydric alcohol containing from 2 to 4 hydroxyl groups at a temperature of about 150°C. to 300°C., reacting the resultant ester with about 2 percent to 8 percent by weight of the acidulated soap stock of an alpha, beta-ethylenically unsaturated polycarboxylic acid, and then blowing the reaction mixture with a member of the class consisting of air and oxygen in the presence of a metallic drier in an amount such that there is present from about 0.0001 to 0.001 percent by weight of active metal, based upon the weight of the acid modified ester, for a time sufficient to remove substantially all of the antioxidants present in said reaction mixture.

Impregnating Composition

U. S. Patent 2,893,881. Songe S. Sakornbut, Kirkwood, Mo., assignor to Monsanto Chemical Co., St. Louis, Mo.

Preserving, water-repellent and fire-retardent composition for cellulosic compositions consisting essentially of a solvent oil boiling between 110°C. and 220°C., from 3 to 8 percent by weight of a normally solid chlorinated phenol, from 8 to 20 percent of a normally solid chlorinated hydrocarbon containing at least 40 percent chlorine, from 3 to 10 percent of a hydrocarbon triester of phosphoric acid and from 0.1 to 2 percent of petroleum wax, the balance of said solution being the said solvent oil, all said percentages being based on the weight of the resulting solution, said solvent oil being present as the principal component.

Epoxy-Alkyd Resins

U. S. Patent 2,895,929. Milton Yusem, Chicago, Ill., assignor to Bradley & Vrooman Co., a corporation of Illinois.

A polymerizable composition adapted to be cured in the presence of an epoxy curing catalyst containing (1) a polymerizable polyether polyepoxide oil modified alkyd resin prepared by the dehydrohalogenation of an epihalohydrin addition product of a short to medium oil modified alkyd resin having from 8 to 20 carbon atoms in the fatty acid molecule, an acid number below 60, and sufficient free hydroxyl groups to provide about ½ to 2½ epoxy groups in each molecule of said epihalohydrin ether, said ether epoxide oil modified alkyd having an ether oxygen atom attached to adjacent carbon atoms forming the cyclic structure and at least two of said epoxide groups being linked in an ether linkage to a hydroxyl group in said alkyd resin molecule and (2) a polymerizable monomeric compound which forms a mixed polymer with (1), which compound contains at least one $CH_2=C=$ grouping, but having no conjugated C to C double bonds.

Modified Alkyd-Emulsion

U. S. Patent 2,895,930. Milton Yusem, Chicago, Ill., assignor to Bradley & Vrooman Co., a corporation of Illinois.

An emulsion coating composition containing water as the dispersing phase and a heat reactive polymer in the oil phase, said heat reactive polymer comprising a member selected from the group consisting of a mixed polymer of an epoxide oil-modified alkyd resin prepared by the dehydrohalogenation of an epihalohydrin ether addition product of a short to medium oil-modified alkyd resin containing from 8 to 20 carbon atoms in the fatty acid molecule, an acid number below 60 and sufficient free hydroxyl groups to provide by reaction with said epihalohydrin to provide about ½ to 2½ epoxy groups in each molecule of said polyether epoxide oil-modified alkyd resin and a vinylidene monomer containing at least one $CH_2=C=$ grouping but having no conjugated carbon to carbon grouping and a mixture of said mixed polymer with said polyether epoxide oil-modified alkyd resin, said heat reactive polymer member being in combination with a member selected from the group consisting of an etherified melamine-formaldehyde resin and an etherified urea-formaldehyde resin.

NEW CARBIUM® FORMULA WITH C-50 PIGMENT CUTS COSTS, IMPROVES FILM CHARACTERISTICS

This low cost 65% Alkyd Flat White with Carbium and C-50 has an initial viscosity of 95 KU. Reflectance and contrast ratio (.003 inch film Morest Chart) are respectively 88.2 and .958. Outstanding is its color and flatting uniformity.

It provides excellent enamel hold out and stain removal properties. In addition, this formula exhibits excellent overlapping, reduction of flashing and ghosting. On washing, polishing effects are minimized.

	Pounds/100 gals.
Titanox C-50	461.00
CARBIUM	282.00
Aluminum Stearate	4.00
Alkyd Flat Vehicle (40% solids)	382.00
Low Odor Mineral Spirits	132.00
24% Lead Naphthenate	3.00
6% Cobalt Naphthenate	2.00
Anti-Skinning Agent	1.00
Total	1,267.00

For further details on this formula and additional data, write Diamond Alkali Company, 300 Union Commerce Building, Cleveland 14, Ohio.

Diamond Chemicals

TECHNICAL Bulletins

PRODUCT INFORMATION

A brochure describing products available from, and containing detailed information about, the firm's new plant in Owensboro, Ky., now available.

The brochure includes a summary of products to be manufactured at the Midwest location, including vinyl acetate polymers and copolymers and butadiene styrene latices in the organic chemicals field, and resin-impregnated fiber battery separators.

Among the manufacturing processes detailed are the use of the highest degree of automation to insure uniformity of product, and flexibility of facilities for easy adaptation of product to specific customer requirements.

W. R. Grace & Co., Dewey & Almy Chemical Division, Dept. PVP, Cambridge 40, Mass.

PULVERIZERS

An new brochure on pulverizers, for the dry pulverizing of materials to micron-size powders, is now being distributed.

Grinding, pulverizing and processing actions of Jet Pulverizers are graphically described in this brochure.

The Jet Pulverizer Company, Dept. PVP, Route #73, Palmyra, N. J.

ACRYLIC COPOLYMER

Technical Bulletin SC-34, entitled *Lustrasol 4290-50*, has been made available.

Specifications, advantages, and properties of Lustrasol 4290-50 are outlined. Typical enamel formulations for black enamel and white enamel are also included.

Reichhold Chemicals, Inc., Dept. PVP, RCI Building, White Plains, N. Y.

PRICE LIST

The American Standards price list and index has been made available.

The 68-page bulletin lists ISO and IEC recommendations.

Fields discussed range from automotive to wood industry and a special index to titles of American Standards and international recommendations is included.

American Standards Association, Inc., Dept. PVP, 70 East 45th St., New York 17, N. Y.

POLYGLYCOLS

The third edition of a bulletin, "Choosing the Right Polyglycol, has just been published by The Dow Chemical Company, and is available for distribution.

The 24-page bulletin lists for 40 polyglycols the formula, description, average molecular weight, specific gravity, pounds per gallon, refractive index, pour, flash, and fire points, approximate solubility, viscosity index, and viscosity in centistokes.

Descriptive and use information is included for each of these polyglycols, along with method of manufacturing and handling precautions. A section explaining how oxides affect properties also is included.

Technical Service and Development, The Dow Chemical Company, Dept. PVP, Midland, Mich.

METAL ACETYLACETONATES

Physical properties and potential uses of Electromet metal acetylacetonates are given in a new four-page folder recently published.

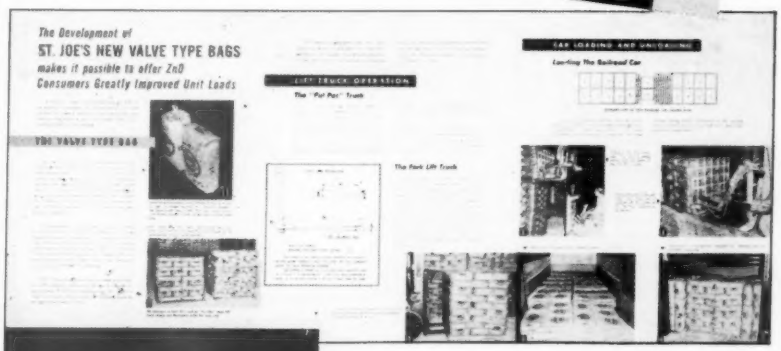
The folder includes literature references on many of these uses.

Union Carbide Metals Co., Division of Union Carbide Corp., Dept. PVP, 30 E. 42nd St., New York 17, N. Y.

FREE

To ALL CONSUMERS of ZINC OXIDE

This 6-page folder describes in detail how the development of St. Joe's new compact valve type bags makes it possible to offer ZnO consumers greatly improved unit loads *PLUS A 15% REDUCTION* in storage space.


The Development of
ST. JOE'S NEW VALVE TYPE BAGS
makes it possible to offer ZnO
Consumers Greatly Improved Unit Loads
LIFT TRUCK OPERATION
CAR LOADING AND UNLOADING
THE VALVE TYPE BAG

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250 PARK AVENUE NEW YORK 17, N. Y.

Plant & Laboratory: Monaca (Josephtown) Pa.

ZNO-144A

MOLECULAR SIEVES

A new booklet, entitled *Chemical Loaded Molecular Sieves*, has been issued.

Molecular Sieves have been known for some time as superior absorbents with a performance far better than other desiccants.

Less well known, however, is their ability to store chemicals to be displaced under conditions and at a time that can be controlled.

The booklet explains how chemicals are stored in Linde molecular sieves, indicates the various established uses of this ability and the sorts of chemicals that can be loaded, outlines a typical case history and shows how extremely volatile di-tertiary butyl peroxide was loaded to advantage as a catalyst in the manufacture of vinyl-containing silicone rubber.

Finally the booklet suggests, in general terms, other uses for chemical-loaded molecular sieves and includes a questionnaire through which additional data can be obtained.

The Linde Co., Division of Union Carbide Corp., Dept. PVP, 30 East 42nd St., New York 17, N. Y.

PAINT PASTE FORMULATION

The Monograph Series, Paint 101—A General Consideration of Paint Paste Formulation, has been made available.

The 12-page publication, the first of a series, deals with formulation and wet grinding techniques.

The Patterson Foundry and Machine Co., Dept. PVP, East Liverpool, Ohio.

HANDLING EQUIPMENT

A new 16-page catalog describing and illustrating the L-S complete line of materials handling equipment is now available.

Designated as Condensed Catalog 80-204 the catalog offers specifications and illustrations on rider fork lift trucks; rider tractors, narrow aisle rider electrics, electric powered "walkies" and manual equipment.

An equipment selector chart gives quick visual reference to each type of equipment manufactured in every line of materials handling equipment. Each unit is readily found in the catalog by a selector page index on the front cover.

Lewis-Shepard Products, Inc., Dept. R9-26/PVP, 125 Walnut Street, Watertown 72, Mass.

TESTING FACILITIES

A new brochure detailing the firm's complete testing facilities has been published.

Pictured and listed is equipment for organic and inorganic chemical analysis; metallurgical physical testing; metallography; spectrographic analysis; corrosion testing; radiography inspection of castings and weldments. A special section describes the use of Cobalt 60 and Iridium 192 for radiography of castings when regular x-ray is no longer feasible.

The Frank L. Crobaugh Co., Dept. PVP, 3800 Perkins Ave., Cleveland 14, Ohio.

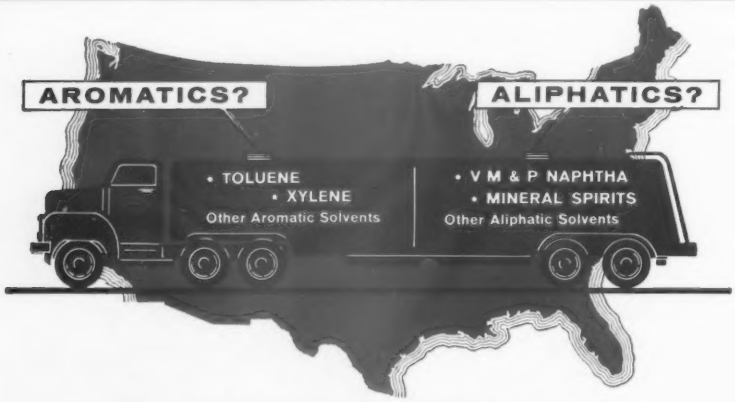
ESTERS

Metholene Esters for Alkylolamides is the title of a new technical bulletin offered.

The procedure is given for using methyl esters of fatty acids as intermediates to produce "super" grade amides having active amide contents of more than 90%, compared to the less than 70% obtained by direct amidation of free fatty acids.

Also listed are complete specifications for Emery's Metholene line of methyl esters, including methyl stearate, palmitate, myristate, laurate, caprate, and caprylate.

Emery Industries, Inc., Dept. 5, Carew Tower, Cincinnati 2, Ohio.



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New Books

A Method for Determining the Epoxy Content of Cured and Uncured Resins

By H. C. Anderson. Published by the Office of Technical Services, U. S. Department of Commerce, Washington 25, D. C. 20 pages. Price $.50.

A chemical method used to determine the epoxy content of cured resins was modified for study of the mechanisms of cure for epoxy resins with amines. Silver nitrate solution and a potentiometric method were substituted for sodium hydroxide solution and a colorimetric method, respectively, in titrating the unused hydrochloric acid of the anlytical reagent. Close agreement between experimental results and literature on theoretical values for pure epoxy resins and compounds verified the accuracy of the modified method. In the cured materials, the results of the chemical method were corroborated by an infrared technique. Grinding in a vibratory ball mill was found to have no appreciable effect on the epoxy determinations in the preparation of the cured, insoluble samples for chemical analysis. Tests also showed that denatured alcohol could be substituted for absolute alcohol for separating the fine, electrostatically charged powder from the steel balls without any apparent effect on the epoxy determinations.

Synthesis of High-Impact-Strength Adhesives From Epoxy Resins

By S. Stivala and A. Resnick. Published by the Office of Technical Services, U. S. Department of Commerce, Washington 25, D. C. 11 pages. $.50.

It was shown that reactive epoxy resins with promising adhesive properties can be synthesized from dihydroxydiphenyl sulfone and epichlorohydrin. The research was aimed at producing liquid epoxy resin adhesives which will cure at room temperature and resist impact between -65 and 160F. Specifically, epoxy resins were synthesized from the 2,4 isomer, the 4,4' isomer, and mixtures of both isomers of dihydroxy diphenyl sulfone with epichlorohydrin in the presence of sodium hydroxide. The sulfone-epoxy resins were found to be low-melting solids extremely reactive with organic aliphatic polyamines, reactive with the m-phenylene diamine and phthalic anhydride, but non-reactive with the amine salt of a fatty acid (DMP-30 and ethyl hexanoic acid). It was also determined that the presence of tertiary butyl groups ortho to the hydroxyl groups in 2,2'-methylenebis (4-ethyl-6-tertiary-butyl phenol) makes this compound sterically hindered in reacting with epichlorohydrin.

Engineering Societies Directory

Published by the Engineers Joint Council, Dept. PVP, 29 West 39th St., New York 18, N. Y. Price $3.50.

The Engineering Societies Directory, 1959 edition, is now available.

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Societies and organizations are listed in the Directory as well as national and international organizations and all state registration boards for professional licensing. A nearly complete listing of Canadian engineering organizations is also included.

Book Notes:

In 1959, the Czechoslovak State Publishing House for Technical Literature, Prague, plans to publish the following works on paint and varnish technology:

Malek, Trnka: *Testing of Coating Substances and Coatings*; Rozan, Vanicek: *Pigments—Powder Paints*; Svoboda, Lvovsky, Trdlica: *The Protection of Steel Constructions in Chemical Plants by Coatings.*

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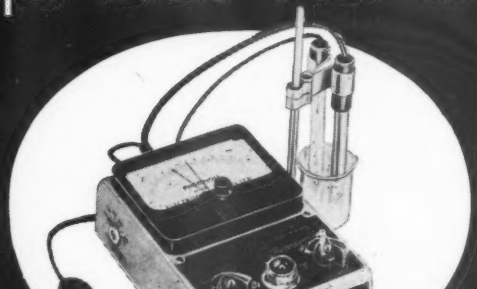

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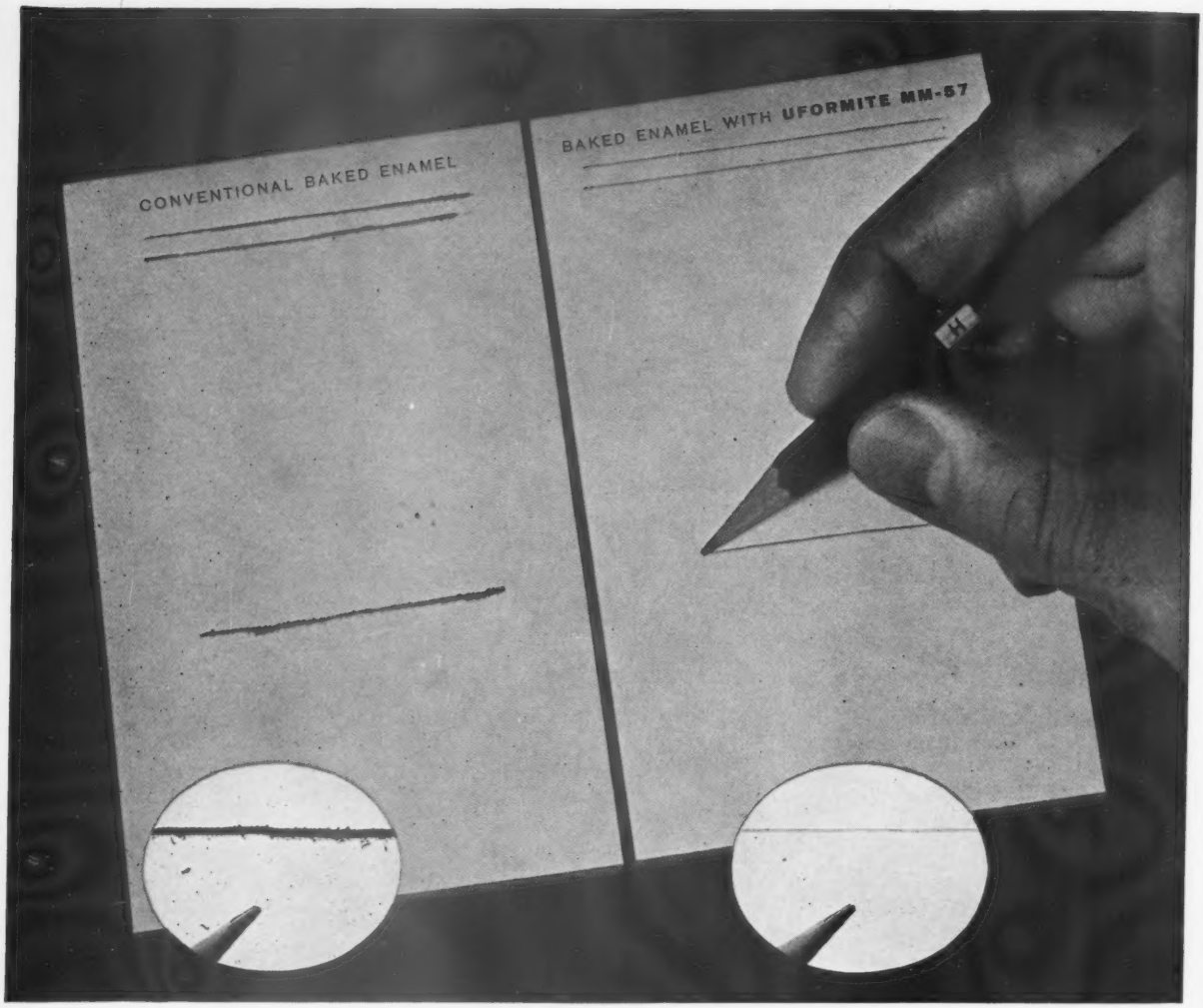
foreign developments

Paint Industry in Denmark

Soviet, Polish and Czech Abstracts

Filling and packaging operations at the S. Dyrup & Company, a modern Danish paint factory. Denmark has some forty paint factories which produce an annual volume valued at 25 million dollars. For an insight of the paint industry in Denmark, see page 89.



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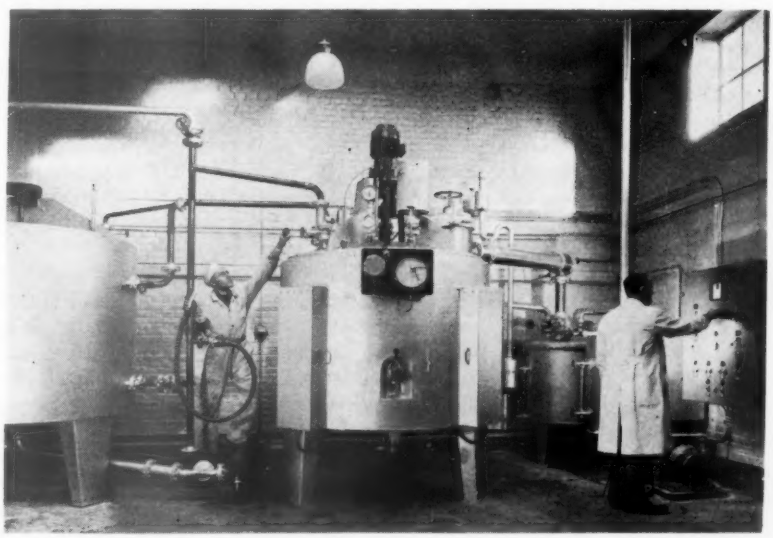
THE PAINT INDUSTRY IN DENMARK

WHEN discussing the paint and varnish industry in Denmark, it is necessary to bear in mind that Denmark is a small country, exactly half the size of the state of Maine. It consists of more than 500 islands, and has a coastal climate, which is often very humid. Apart from large deposits of chalk and clay, Denmark has none of the natural resources necessary for the development of a large chemical industry. The lack of great forests makes the wooden houses which are so common in the United States, a rarity in Denmark, where nearly all buildings are made of bricks. In spite of this, the paint and varnish industry in Denmark has progressed so rapidly during the last decade, that it has been able to develop a sizable export market, and to establish subsidiary factories in several foreign countries.

The paint and varnish industry comprises approximately 40 factories with a total production approaching the 25 million dollar mark. The industry has a highly developed technical staff, employing more than 100 chemical engineers in research, development and production. Here, one advantage of belonging to a small country can be plainly seen—technical people in Denmark must know other languages than their native tongue. Nearly all of them read English, German and French, whereby they can benefit from the valuable technical and scientific information to be obtained in the books, articles and brochures published in the United States and Great Britain as well as in Germany and France.

Raw Materials

Apart from the three manufacturers of raw materials, Kemish Vaerk Koge, Inc., (organic pigments), Smelting, Inc. (zinc oxide) and Polyplex, Inc. (synthetic resins), which were mentioned in an article covering the Danish Paint and Varnish Industry and published in an earlier issue of this magazine by K. Christensen, and the oil factories which produce linseed oil and other drying oils and fatty acids, Denmark has no large plants



S. Dyrup & Co. uses electrically heated kettles for cooking varnishes and oils.

The information used in this article was furnished by H. K. Raaschou Nielsen, Director of Research, Central Research Laboratory of the Danish Paint and Varnish Industry.

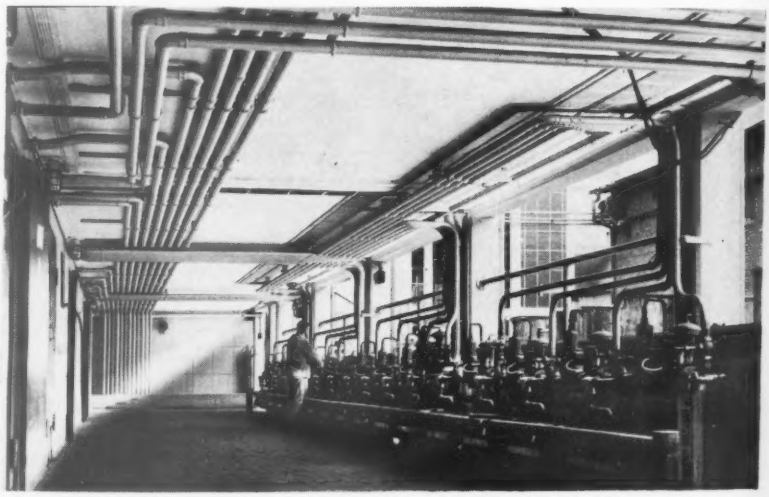
Laboratory assistant measuring thickness of floor varnish by means of radioactive isotope method.

for the manufacture of raw materials, but utilizes imported products. A number of Danish paint and varnish factories, however, manufacture a large proportion of the alkyd resins used for the production of air drying and baking alkyd enamels.

Architectural Coatings

In as much as most Danish houses are constructed of bricks, the production of house paints for exterior use is proportionately much smaller in Denmark than in the United States. Nearly all of the ready mixed paints used for exterior wood work are employed as "do it yourself" paints for the repainting of windows, and for this purpose very long oil alkyd paints have been replacing the slower drying oil based house paints to a great extent during the last five years. For the painting of interior wood work, the same types of alkyd paints are rapidly replacing the old time stand oil enamels and the ordinary alkyd enamels, because of their easy brushability and relatively short drying time.

The wood work in new houses is usually painted by highly trained journeyman painters, who even today often mix their own oil paints, although some tendency towards the use of factory-made paints has been observed during the last decade. The habit of mixing oil pastes with boiled linseed oil, driers and turpentine, however, is still widely used, and since the use of ordinary pigment pastes containing a very high proportion of pigment may lead to paints of uncontrolled composition and relatively poor quality (when the mixing is done at the building site), an attempt has been made during the last couple of years to introduce special "building paint pastes". These pastes differ from the ordinary pigment pastes by containing a higher amount of linseed oil and sufficient anti-skinning agent to prevent skin formation. The pigment volume concentration chosen for the building paint pastes (45%) corresponds to that of an undercoater and, in addition, makes the pastes more fluid and easier to handle. This simplifies the preparation of priming and finishing paints on the building site, since very simple volume relationships exist between the amounts of pigment paste and boiled linseed oil needed.



Pneumatic pumps are used to pump highly inflammable solvents.

Because of the high quality of Danish bricks, houses made from this material are often left without any further surface treatment. Applying a coat of white wash, however, is frequently used, especially in the country. Painting of brick houses is usually only carried out on plaster walls, and for this purpose latex paints based on emulsions of polyvinylacetate or other high polymers are replacing the oil based paints previously used to a great extent. Latex paints also find increasing use in the painting of exterior surfaces of concrete walls. Another coating material commonly used for exterior concrete walls is Portland cement paints.

The use of wall paper or calcimine for the decoration of new interior walls is still very common, because of the low cost, but for the refinishing of the walls, which is often a "do it yourself" job, latex paints and flat paints based on high viscosity alkyds are becoming increasingly popular, due to their well-known advantages; easy application, quick drying, and excellent washability.

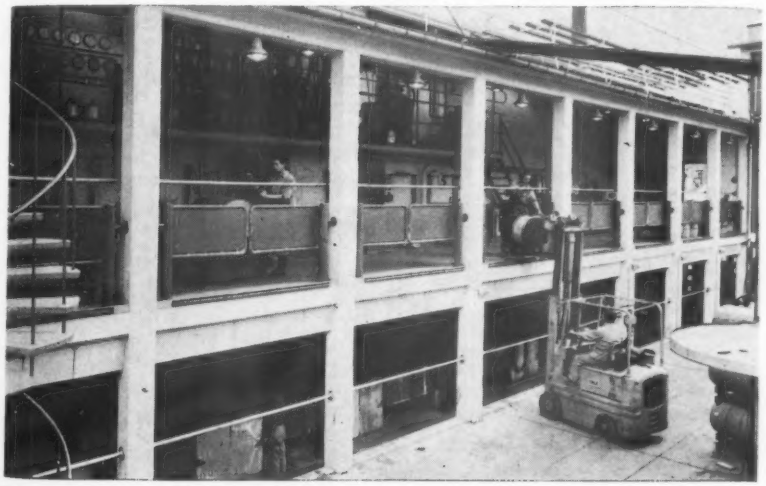
The upkeep of wooden floors, many of which are made from pine boards, constitutes a problem of great importance for the Danish house wife, and the paint and varnish industry has done an excellent job in developing quicker drying and more abrasion resistant floor varnishes. The use of the Taber abraser for evaluating the abrasion resistance has played an important role in the development of better oleo-resinous floor varnishes, which dry in two hours and are twice as abrasion resistant as the four-hour varnishes, widely used ten years ago. In this connection it may be of interest to mention that one Danish factory has made use of isotopes in measuring the practical abrasion resistance of floor varnishes. (Fig. 1). The production of floor varnishes is declining, however, due to the growing use of parquet floors, which are kept up by waxing, and of plastic floor tile.

Industrial Coatings

While Denmark is usually thought of as a predominantly agricultural country, nevertheless, industry plays an increasingly large role in the national economy, and

today the export value of industrial goods from Denmark is gaining rapidly and may soon exceed that of agricultural products. Because so many of these goods are painted articles, the manufacture of industrial coatings by the paint and varnish industry is increasing rapidly, and today the majority of the organic coatings used for the finishing of industrial products are manufactured by Danish factories.

The types of industrial coatings manufactured are on the whole the same as the ones produced in other countries. Baking enamels based on mixtures of amino and alkyd resins are used in large quantities for the finishing of refrigerators and other kitchen equipment, bicycles, venetian blinds (of which Denmark has a very large export) and many other items, and hammer and wrinkle finishes are manufactured for the finishing of office machines and similar equipment. Factories, which do not have facilities for baking the finished products use styrenated alkyd enamels and nitrocellulose lacquers, but two component systems based on epoxy resins and polyamines and polyamides as well as on polyisocyanates and polyester resins are finding increasing use for products requiring a finish with an especially high chemical and mechanical resistance. For larger items, as for example agricultural machinery, air-drying rust-inhibitive primers and alkyd enamels are usually the preferred system.

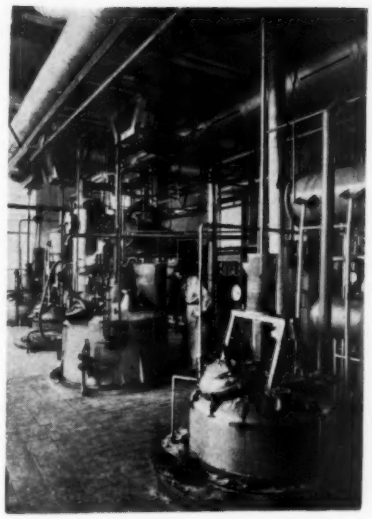


Because of the highly inflammable and toxic nature of the solvents used in this building, one facade is left open.

In connection with the discussion of industrial finishing in Denmark, the special problem of blistering of painted automobiles must be mentioned. Blistering occurs on automobiles which have been painted in Denmark as well as on cars finished in other countries where the problem is of less importance. This calamity, when it occurs, is undoubtedly connected with the very humid climate in this region of Europe, and there can be no doubt that a very careful phosphatizing process followed by a finishing system with maximum blistering resistance is especially important in Denmark, where the cars are often exposed to long-lasting humid weather shortly after finishing.

Furniture Finishing

During the last ten years the value of Danish furniture exported has increased from practically nothing to approximately 15 million dollars. The reason for this growing interest in Danish furniture lies primarily in the light and functionalistic style and the excellent workmanship of the furniture, but the finishing of the wood naturally plays an important role also. The treatment of teak furniture with special quick drying synthetic "teak oils" instead of the application of linseed oil, previously used, leaves a surface, the character of which does not differ too much from the untreated teak wood, but which at the same time is considerably more resistant, especially to water. If a still more resistant surface is desired, the most common treatment is the application of a flat, acid-hardening urea-formaldehyde lacquer.



A typical synthic resin operation in a Danish paint plant.

For the manufacture of glossy wooden surfaces, the use of nitrocellulose lacquer is still predominant, but acid-hardening urea-formaldehyde lacquers are being used to a greater and greater extent, partly because of their better resistance towards abrasion and solvents, and partly because of their fire retardant properties, which makes them expecially suitable for furniture to be used in theaters, movie houses and on board ships. During the last couple of years, pigmented acid-hardening urea-formaldehyde enamels also, have found increasing use, especially for the finishing of beech and oak furniture.

Anti-Corrosive Paints

The protection of the large bridges which connect many of Denmarks islands is one of the main reasons why great emphasis has been placed on the development of effective anti-corrosive paint systems. The humid climate and the closeness to the North Sea makes the protection of the bridges and other steel structures a very difficult job, and there are good reasons why the Danish State Railroads require that before painting the bridges all steel surfaces must be blast-cleaned to "white" metal. All the rust-inhibitive pigments available—red lead, lead chromate, salt free zinc chromate, lead cyanamide, calcium plumbate etc.—have been investigated care-

fully in the various Danish climates, and several effective pigment combinations have been worked out by the paint factories.

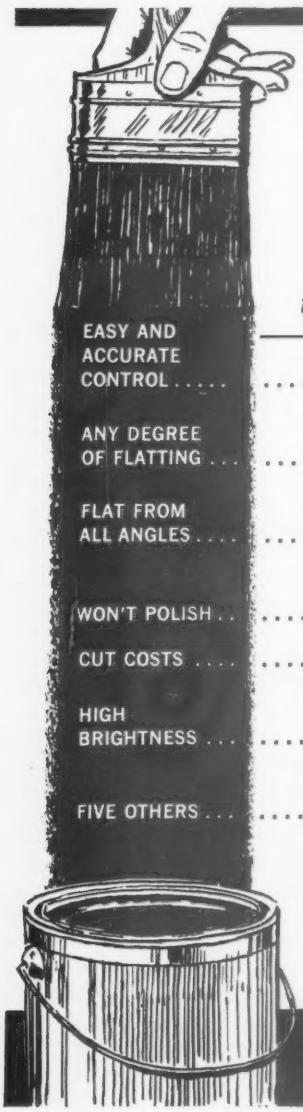
Special difficulties were encountered ten years ago in connection with the repainting of the Oddesund bridge in Jutland, a low-lying bridge, situated very close to the North Sea and therefore exposed to unusually severe corrosive action. Extensive pitting had occurred and for this reason it was decided to sand-blast the bridge and to apply a 6.5 mils thick zinc layer by spraying, after which the zinc was protected with one coat of zinc chromate primer and two coats of weather resistant finishing paint.

An important development following the end of the second world war has been the establishment under the Academy of Technical Sciences of a *Central Research Laboratory of the Danish Varnish and Paint Industry*, the purpose of which is to supplement the research and development work being carried out in the laboratories of the individual Danish paint and varnish factories. One of the main functions of this laboratory is to work out testing methods for finished paints and varnishes, and to procure expensive apparatus and instruments—as for instance an Atlas weather-Ometer and a salt spray cabinet, spectrophotometers and other optical instruments—which are used in connection with the work in the central laboratory as well as by members of the various Danish paint and varnish factories. In addition, the laboratory maintains an up-to-date library of more than 1,000 handbooks and approximately 60 magazines from 15 different countries and sends out monthly lists of the articles indexed by the laboratory staff. At present the number of indexed cards in the library file amounts to approximately 30,000. Since most of the Danish paint and varnish plants are situated in the neighbourhood of Copenhagen, very few of the factories go to the trouble of maintaining individual files of literature reference cards, but use the central library for literature search and regularly borrow magazines.

Another important job of the central laboratory is to serve as a liaison office between the individual paint and varnish laboratories and the many special laboratories which carry out basic and applied research of importance for the protective coatings industry, as for example the laboratories specializing in infrared spectroscopy, X-ray diffraction, electron microscopy, microbiology, corrosion, wood technology etc.

In connection with the working out of specifications for government organizations, such as the departments of defense, and for industrial consumers of protective coatings, the central laboratory is often contacted as an independent institution. As far as it is possible to prescribe reliable testing methods, it is attempted to base such specifications on properties and not on the composition of the particular protective coating.

The last, but not the least important job of the laboratory is to teach the chemical engineering students who wish to specialize in the paint and varnish branch of chemical engineering. The students spend half a year in the laboratory, during which time they carry out the lab work on the basis of which the thesis necessary for their final examination is written. The subjects selected for the engineering students are usually chosen in such a way that the work done supplements the general research work carried out by the laboratory staff.



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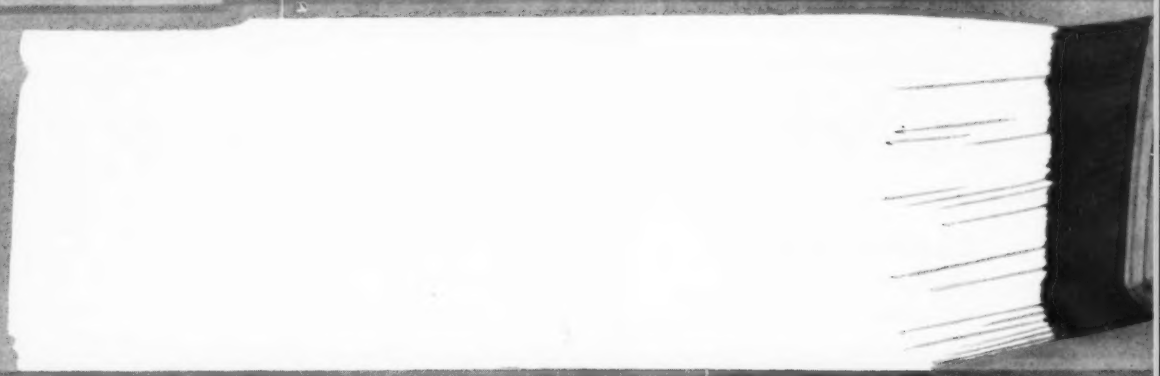

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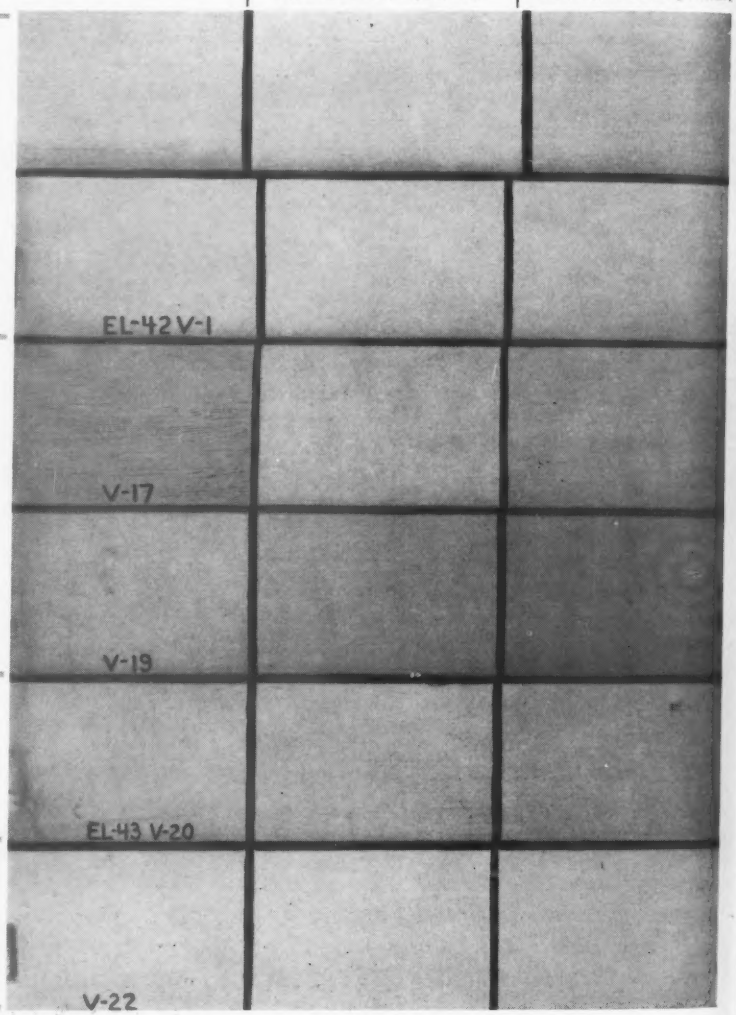
RED CEDAR (3 years' south vertical exposure in Delaware)



POLYVINYL ACETATE

"ELVACET" 1423 (30% PVC)

Note: Excellent condition . . . there is some cedar stain on left section, which is self-primed.

"ELVACET" 81-900 (28% PVC)

Note: All three sections are in excellent condition.

ACRYLIC

ACRYLIC (50% PVC)

Note: Self-primed section on left has failed. The cost of this acrylic paint is comparable to that of the PVA paint (above).

ACRYLIC (25% PVC)

Note: All sections are in good condition, but this paint *costs about 33% more* than PVA paints above. Note dirt collection.

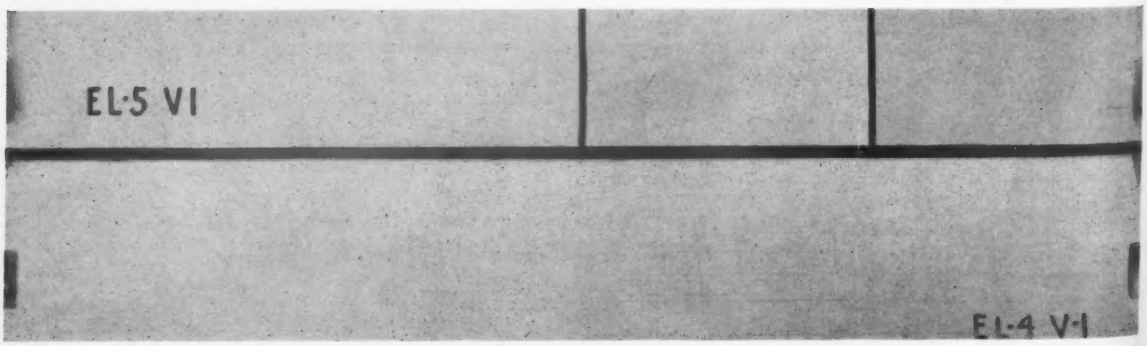
ALKYD FLAT

Note: Left section (2 coats) is in good condition. There is some cracking in other two.

LINSEED OIL

Note: This self-cleaning paint is in good condition. See the chalk wash down over the black code number.

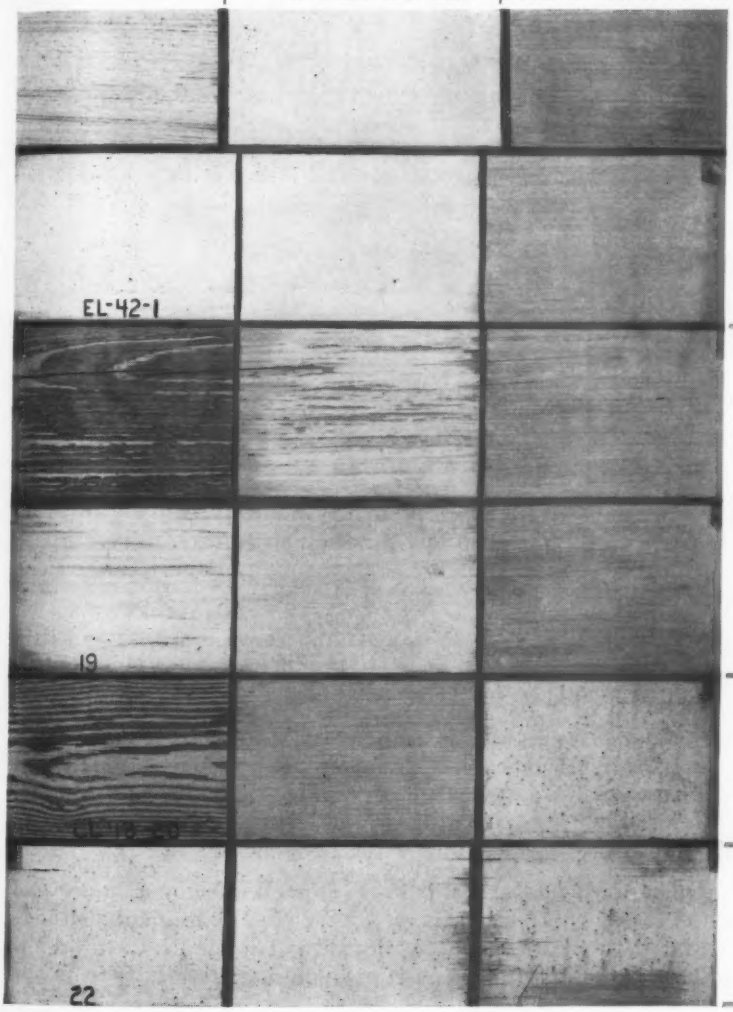
RED CEDAR (5 years' south vertical exposure)



make a water-based paint for performance at lower cost!

SOUTHERN YELLOW PINE (3 years' 45° south exposure in Delaware)

(2 coats of test paint	(2 coats of test paint over linseed oil primer)	(*Control*—coat of linseed oil primer; coat of linseed oil house paint)



POLYVINYL ACETATE

"ELVACET" 1423 (30% PVC)

Note: Left self-primed section is beginning to fail—center section over oil primer is in good condition—control paint has failed by erosion and cracking.

"ELVACET" 81-900 (28% PVC)

Note: Both PVA "test paint" sections are still in good condition, while the control paint has failed.

ACRYLIC

ACRYLIC (50% PVC)

Note: Both "test paint" sections have completely failed. The cost of this paint is comparable to that of PVA paint used above.

ACRYLIC (25% PVC)

Note: Excessive dirt collection. While this acrylic paint is in fairly good condition, it *costs about 33% more* than the "Elvacet" base paint (above).

ALKYD FLAT

Note: Both self-primed and oil-primed sections have shown severe failure.

LINSEED OIL

Note: All three sections show the effects of erosion and cracking, plus excessive mildew and dirt pickup.

POLYVINYL ACETATE

Note: Based on "Elvacet" 81-900 (27% PVC)—left and center sections are in excellent shape (left is 2 coats of test paint; center is 2 coats of test paint over oil primer). Right section (one coat of test paint over oil primer) needs repainting.

LINSEED OIL (entire panel)

Note: Conventional linseed oil house paint is eroded through to the primer, and panel should be repainted.

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An Announcement

BEGINNING with the November issue, a new monthly column entitled, *The Aerosol Corner* will appear in our Production Section. The purpose of this new feature is to keep you abreast of the many important developments taking place in the burgeoning field of aerosol paints.

Last year some 70 million cans of aerosol paints were produced, and it is expected that the volume for 1959 will reach 100 million cans. It is estimated that by 1965 the production of aerosol paints will bulge to 250 million cans.

One of the big factors behind the steady growth of aerosol paints is the "do-it-yourself" consumer. Women like the easy application characteristics of these paints and especially appreciate not having to clean paint brushes. For touch-up work and refinishing furniture, cabinets, toys, etc., aerosol paints have gained wide spread acceptance among the homeowner.

In industrial applications, the aerosol paint can has become a standard tool in maintenance kits for touching-up purposes. Likewise, many manufacturers supply aerosol paint cans with machinery, furniture, appliances, etc. in the event of scuffing or scratching during transit or upon installation.

Specialty coatings such as wrinkle and hammertone finishes, and more recently multi-color finishes are now available in aerosol cans.

Aerosol paints now represent about 2.5% of the total retail paint market. With a growth of 150% predicted for the next five-year period, the potential market for aerosol paints is indeed very bright. It is within this period that important developments in formulation, packaging, propellants, and marketing will take place.

To help you keep informed of these trends and developments, we alert you to our new monthly feature, *The Aerosol Corner*, beginning in November.

The Editor

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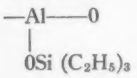
SOVIET, POLISH and CZECH ABSTRACTS

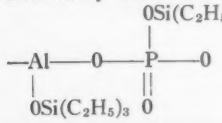
New Polymer Synthesis With Inorganic Molecule Chain

By K. A. Andrianov, A. A. Zhdanov, & A. A. Kazakova, "Izvestiia Akademii Nauk SSSR, Otdelenie Khimicheskikh," 1959, 467-471, March 1959.

$Ti[0Si(CH_3)_3]_4$ (dodecamethyltitanoxytetrasiloxane, b.p. 100°C), $Ti[0Si(C_2H_5)_3]_4$ (dodecaethyltitanoxytetrasiloxane, b.p. 204°C), and $Al[0Si(CH_3)_3]_3$ (nonamethylalumoxytrisiloxane, m.p. 98-100°C) were prepared by decomposing sodium triethylsilanolate with $TiCl_4$, and sodium trimethylsilanolate with $TiCl_4$ and $AlCl_3$. It was established, in the course of investigating the hydrolytic stability of $Al[0Si(C_2H_5)_3]_3$ (nonaethylalumoxytrisiloxane, m.p. 327°C), the polyorganosilylalumoxanes–polymers having elementary chain of the formula



—are formed in the hydrolysis process. Similarly, polyorganosilylphosphoralumoxanes are formed when nonaethylalumoxytrisiloxane is heated at 160-180°C with tris-triethylsilylphophate; the elementary chain has the formula



Analogous polymers are also formed in the reaction of nonaethylalumoxytrisiloxane with triethylsilylphosphoric acid. It is concluded that such elements as Al, Ti, P, and other elements of the second, third, fourth and fifth groups of the Periodical Table may be synthesized into polymers. The latter are soluble in organic solvents, and form films (upon solvent evaporation) which possess plasticity. The elastic properties, characteristic of high polymer compounds, are lent to them by organic radicals.

Polymerization of Vinylidene Chloride

By A. Hrivik, M. Lazar, & S. Kovac, "Chemicke Zvesti," Vol. 13, 2:117-123, February 1959.

The purpose of the study was to investigate the effect of several solvents upon the rate of heterogeneous polymerization of vinylidene chloride, and to determine the dependence of total polymerization rate upon monomer concentration. The polymerization of vinylidene chloride was initiated by benzoyl peroxide at 80°C, in the presence of 1,1,2-trifluorotrichloroethane, chloroform, benzene, and cyclohexanone. These solvents were found to affect both the polymerization rate and order. In the case of chloroform, the reaction order, with respect to monomer concentration, is equal to unity. For 1,1,2-trifluorotrichloroethane, reaction order varies between 1 and 3.5; for benzene, 2-1; for cyclohexanone, 1.3-0.7. For monomer concentration of 5.033 mole/1 and benzoyl peroxide concentration of $8.26 \cdot 10^{-3}$ mole/1 in temperature range 60-80°C, the total activation energy for the studied solvents equals 21 kcal/mole. Activation energy for bloc polymerization of vinylidene chloride is 16.00 kcal/mole; this is in agreement with values found by others.

Heterogeneous Chain Polyamides Studies

By T. M. Frunze, V. V. Korshak, & L. V. Koslov, "Izvestiia Akademii Nauk SSR, Otdelenie Khimicheskikh Nauk," 1959, 3:535-539, March 1959.

Polyamides and polyamido-esters were synthesized by the reaction of bisoxazolones with diamines, glycols and amino-alcohols, in a solvent medium and at temperatures not exceeding 60°C. Reaction time depends on the nature of the starting compounds; diamines, which react relatively fast, take 5-14 hours for complete reaction. The end products are solid powders, white, well soluble in cresol, insoluble in chloroform and benzene. The regularly prepared polyamides (by reaction of bisoxazolones with diamines) have higher melting points than polyamides prepared by direct polycondensation and containing traces of starting materials (terephthalic acid). The replacement of the octamethylene group in a polymer having regular structure with a phenylene group results in a higher melting point in a polymer with irregular macromolecular structure. Example: A solution of 0.82 g of hexamethylene diamine in 20 ml pyridine was added rapidly to a solution of 2 g of 2,2'-octamethylenebis-[5(4H)oxazolone] in 60 ml dry pyridine, at room temperature and with stirring. The substance was heated at 60°C for five hours while dry nitrogen was passed through. The polyamide sediment was then separated, washed in benzene, and dried in vacuo at 60°C. The white product melts at 180-190°C, and is soluble in cresol. With glycols and amino alcohols, the reaction time was at least 100 hours.

Color Binders in Multi-Color Autotype Printing

By E. V. Kanygina & A. T. Burmistrova, "Sbornik trudov Vsesoiuznogo nauchno-issledovatelskogo instituta Goznaka," 1:170-176, 1956.

The resin, prepared by copolymerization of condensed (by polymerization or oxidation) mixture of tung (10%) and linseed (90%) oils with 30% styrene and subsequently dissolved in oxidized drying oil, is suitable for use in colors for multi-color auto-type printing. Since successive superimposition of different colors may take place in 4 hours, the manufacturing cycle is shortened 2-3

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times in comparison with using polymerized drying oil; the color tone is also improved. Weight ratios between resin and drying oil are 75:25 or 65:35, depending on product. (*Referativnyi Zhurnal Khimiya*, 8:29672, 1950.)

Organosilicon Resins and Lacquers

By K. A. Andrianov, D. Ia. Zhinkin, & A. F. Moiseev, "Khimicheskaya Promyshlennost'," 2:106-11, March-April, 1959.

A review article discussing, with references to original literature, the chemistry of organosilicon polymer compounds, properties of organosilicic resins and lacquers and their uses as electric insulating materials, protective coatings and plastics. 73 references to literature.

Synthesis of Typographic Drying Oils from Tall Oil

By M. F. Sorokin, "Khimichskaya Promyshlennost'," 2:144-149, March-April 1959.

A discussion of various methods of tall oil refining, used in production of clear typographic drying oils. Refining methods dealt with descriptively are: physical and chemical methods; distillation *in vacuo* distillation with water vapor. The characteristics of drying oils, prepared from glyphthalic resins (64% tall oil, 14% glycerine, 22% phthalic anhydride, 0.05% pyrolusite) synthesized on various fractions of tall oil distilled in vacuum at 5 mmHg pressure, are tabulated.

Investigation of Epoxide Resins

By L. I. Golubenkova, "Vysokomolekyl-yarnye Soedineniya," Vol. 1, 1:109-113, 1959.

A study of the hardening process of epoxide resins (molecular weights = 400, 500, 1500, 2000) by the action of the phthalic and maleic anhydrides of dicarboxylic acid. Thus processed epoxide resins are characterized by high heat stability (250°C) which considerably exceeds that of amine-hardened resins. Maleic anhydride use results in faster hardening rates than use of phthalic anhydride; products hardened by the former are less elastic at high temperatures and less fragile at room temperature than products hardened by phthalic anhydride.

Vinyl Polymers as Raw Materials

Przemysl Chemiczny," Vol. 38, 3:150-154, March 1959.

A discussion of the preparation and use in various lacquers of polyvinyl acetates MOWILITH 20 and MOWILITH 30. The characteristics of these polymers are dealt with: effect of solutions, solvents, plasticizers, mixing with pigments, dispersions, storage and transportation. The author is with West-German firm Hoechst A. G., Frankfurt/Main.

Carbon-Chain Polymers and Copolymers

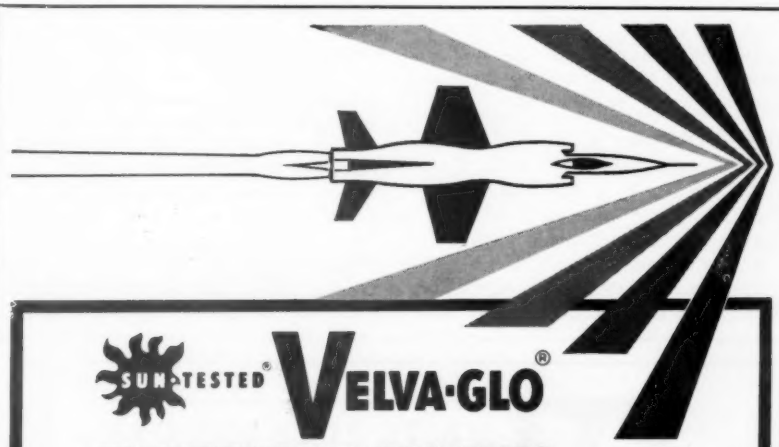
By H. S. Kolesnikov, N. V. Klimentova, & T. E. Ermolaeva, "Izvestiia Akademii Nauk SSSR, Otdelenie Khimicheskikh Nauk," 4:726-730, 1959.

Earlier, the authors have described the catalytic action of tributylboron in the polymerization of unsaturated compounds such as acrylonitrile, methylmethacrylate, styrene and ethylene (*Izvestiia AN SSSR, Otdel. Khim. Nauk*, 1957, pp. 236, 652; *Khimicheskaia Nauka i Promyshlennost'*, 1957, p.663). The present paper reports on some relationships in the polymerization of styrene and methylmethacrylate, in a toluene solution and using tributylboron as catalyst. Methylmethacrylate was polymerized at 60°C for three hours, at a concentration of 0.25 mole methylmethacrylate per 100 ml toluene; catalyst concentration changed from 1 to 6 mol. % (rel. to methylmethacrylate). The reaction was carried out in atmosphere of nitrogen, and the polymer was separated from monomer by distillation with water vapor. Polymerization of styrene was effected at 50°C. in four hours, taking styrene concentration of 0.25 mole per 100 ml toluene. In the reaction conditions described catalyst concentration of 2 mol. % is minimal; lower catalyst concentrations decrease the polymer yield. Increase in the temperature of polymerization increases the yields of both polymers, and has no effect upon the specific viscosity of the polymer solutions. The yield of polymethylmethacrylate increases during the first three hours, then levels off to constancy; the specific viscosity of 0.5% polymer solution in toluene is alsmot independent of increase in polymerization time. Polystyrene yield becomes constant already after one reaction hour, while its molecular weight increases during the first four hours of polymerization, then levels off. An increase in monomer concentration in the starting solution leads to higher polymer yields and to higher molecular weight of product. The results are tabulated. An explanation for the relatively low molecular weights of the prepared polymers is proposed.

Complex Phenol-Aniline-Formaldehyde Resins

By S. N. Ustinov, "Khimicheskaya Promyshlennost'," 1:42-44, January-February 1959.

Thermoactive (insulating) phenol-aniline-formaldehyde resins are expected to combine the positive characteristics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of phenol-formaldehyde and aniline-formaldehyde resins, as well as contribute other desirable properties. Mixing the two resins (phenol-formaldehyde and aniline-formaldehyde) does not result in a product with uniform structure. A thermoactive resin was prepared by a two-phase condensation of phenol and aniline with formaldehyde (Frey, *Helvetica Chim. Acta*, vol. 18, 491). In the first phase, phenol was condensed with excess of formaldehyde in presence of ammonia at 70°C. in 90 min. Condensation of aniline with the remaining formaldehyde, in HCl medium and at temperatures not exceeding 85°C. ensued in the second phase. Phenol-aniline-formaldehyde resin contains phenol and aniline linked by methylene groups. The rate of resin hardening increases with increasing aniline content. Resins having up to 30% aniline are soluble in alcohol, those containing over 40% aniline are soluble in alcohol only with heating. Benzene and benzene-alcohol mixture act as good solvents. The rate of hardening also increases with the increasing content of formaldehyde in the resin. The insulating properties of the resin are considerably affected by the filler used; the authors recommend the use of inert mineral substances as fillers, while glass fiber improves the mechanical properties of the resin more than powdered mineral substances. The paper tabulates the properties of resins, consisting of 40% phenol-aniline-formaldehyde resin (of varying aniline content) and 60% filler (two parts of glass fiber and 1 part of asbestos).

Epoxy Stabilizers of Polyvinylchloride

By A. A. Berlin, E. N. Zil'berman, N. A. Rybakova, A. M. Sharetskii, & D. M. Ianovskii," Zhurnal Prikladnoi Khimii," Vol. 32, 4:863-868, April 1959.

The paper offers some comparative data on the stabilizing activity of several industrial and laboratory-synthesized compounds. The following were studied as stabilizers for polyvinylchloED-6; newly synthesized low-molecular epoxy resins based on 2,2-bis-(4-oxy-3-methylphenyl)-propane, 1,1-bis-(4-oxy-phenyl)-cyclohexane, 1,1-bis-(4-oxy-methylphenyl)-cyclohexane, and 2,2-bis-(4-oxy-3-nitrophenyl) -propane; newly synthesized *cis*-9,10-epoxybutylstearate, and epoxidized castor oil and whale oil. With the exception of 2,2-bis-(4-oxy-nitrophenyl)-propane, the enumerated compounds were established as effective thermo-stabilizers of polyvinylchloride, contributing to improvement of the physico-mechanical properties of masticated rubber. The use of mixtures of low-molecular epoxy resins (or epoxidized triglycerides) with lead silicate leads to higher thermostability of PVC and to better quality of masticated rubber than does the use of these stabilizers separately. The stabilizing action of epoxy compounds, and the physico-mechanical properties of masticated rubber prepared with epoxy stabilizers are tabulated.

Protection of Building Constructions form Corrosion

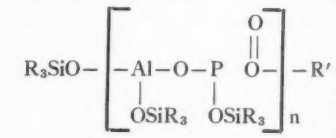
"Promyshlennoe Stroitel'stvo," 3:21-23, March 1959.

The author discusses various situations and conditions under which corrosion attacks building construction materials, and with ways of protecting them. Bitumens, vinyl plastics and, especially, lacquers and enamels based on perchlorovinyl resin have found wide application in the Soviet Union as protective, chemically stable materials. Their cost (4-6 rubles per one kg) can still be lowered by employing cheap asphalt primers, or bitumen mixtures. Other materials employed in the USSR for anti-corrosive protection of steel are vinyl plastics, polyethylene, polyisobutylene, fluoroplastics, and liquid polymerizing compounds such as styrene, fur furol, epoxy resins, etc. Epoxy lacquers, which have recently became available in the USSR, are said to be produced in limited amounts only. The surface of concrete (used as anti-corrosion protector) is usually treated with lacquers or paints. The paper also deals with some non-organic protective coatings used in the building construction industry.

Synthesis of Polymers With Inorganic Molecular Chains

By K. A. Andrianov, A. A. Zhdanov, & A.A. Kazakova, "Zhurnal Obschchei Khimii," Vol. 29, 1281-1284, April 1959.

The character of polyalkylsiloxyaluminophosphates, formed in the condensation of tris-(trialkylsilyloxy)-aluminum with phosphoro-silico-organic compounds, depends on the nature of the radical in the trialkylsiloxane groups. A low-molecular condensation product was prepared by the condensation of 2 mol. tris-(triethylsiloxy)-aluminum with 1 mol. triethylsiloxyphosphinic acid; the product was a viscous, transparent liquid, soluble in alcohol, benzene and toluene. In the condensation (at 200-220°C.) of equimolecular quantities of tris-(triethylsiloxy)-aluminum with triethylsiloxyphosphinic acid or with tris-(triethylsilyl)-phosphate, a polymer product of the following structure was obtained:



where R′ = H or SiR-. The polymer is soluble in toluene, alcohol and benzene; upon further heating it passes into non-liquifiable, insoluble state. Solid, powder-like, non-liquifiable products, insoluble in organic solvents, were formed in the condensation of tris-(trimethylsiloxy)-aluminum with trimethylsiloxyphosphinic acid or with tris-(trimethylsilyl)-phosphate.) Polymer compounds with inorganic molecular chains containing aluminum, oxygen and phosphorus were prepared by authos earlier and described in *Izvestiia Akademii Nauk SSSR, Otdelenie Khimicheskikh Nauk*, 1959, p. 466 et seq.

Device for Recovery of Color Solvents

By S. A. Karpov & I. N. Fedosov, "Poligraficheskoe Proizvodstvo," 6:11-12, 1958.

Description and schematic drawing of a device for recovery of solvent (toluene, xylene, benzene) vapors escaping during drying of deep-printing colors on quires. Activated carbon is used as adsorbent; 950 kg carbon absorbed 80 kg solvents. (*Referativnyi Zhurnal Khimiya, 8:29673, 1959.*)

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LEAFING

(*From page 38*)

Method of Stabilization

Finally, the formulation of paints containing Alcoa Stabilizer No. 5 should be discussed. We have found that the optimum quantity of stabilizer is 2.5 mg. per acid number per gram vehicle solids, which is equivalent to four ounces per acid number per 100 pounds of vehicle solids. All tests have indicated that at this concentration leaf stability and performance are at their optimum.

In formulating with Stabilizer No. 5, some specific recommendations should be followed to obtain superior products. In all cases, the stabilizer should be added to the vehicle before pigment and drier additions. The reason for this sequence is that the additive will also react with metal salts which, of course, will delay the drying of the paint. The formulating recommendations of Stabilizer No. 5 are that the correct acid number and vehicle solids content be determined and the 2.5 mg. of stabilizer then be added for each acid number per gram of vehicle solids, which converts to four ounces per acid number per 100 pounds of vehicle solids. The stabilized mixture should then be allowed to stand for a minimum of 18 hours at room temperature. After this time, the pigment should be dispersed with conventional dispersion equipment. After pigment incorporation, drier should be added. It has been found that a combination of 0.05 per cent cobalt, 0.03 per cent manganese, and 0.5 per cent zirconium insures trouble-free drying for long oil alkyds. It is important that the drier should be added last for the reasons already discussed. When using Alcoa Stabilizer No. 5, no antiskinning agent should be employed, since this additive also acts as an effective anti-skinning agent.

REFERENCES

(1) Bigelow, W. C., D. L. Pickett and W. A. Zisman, "Oleophobic Monolayers," J. Colloid Sci. **1**, 513, (1946); **2**, 563, (1947).
(2) Bartell, F. E. and M. Van Loo, "Colloid Chemistry of Color Varnish," Ind. Eng. Chem., **17**, 925, (1925).
(3) Ann. Chim. Phys. (7) **23**, 62, (1901) and (8) **24**, 563, (1911).
(4) Edwards, J. D. and R. I. Wray, "Aluminum Paint and Powder," Third Edition, Reinhold Publishing Corporation, p. 60, (1955).

CALENDAR

Sept. 13-18. 136th National Meeting, American Chemical Society, Atlantic City, N. J.
Oct. 19-21. Annual Convention of the National Paint, Varnish & Lacquer Assn., Chalfonte Haddon Hall, Atlantic City, N. J.
Oct. 22-24. 37th Annual Meeting and 24th Paint Industries' Show of the Federation of Paint & Varnish Production Clubs, Convention Hall, Atlantic City, N. J.

PRODUCTION CLUB MEETINGS

Baltimore, 2nd Friday, Park Plaza Hotel.
Chicago, 1st Monday, Furniture Mart.
C.D.I.C., 2nd Monday.
Cincinnati — Oct., Dec., Mar., May, Hotel Alms.
Dayton — Nov., Feb., April, Suttmilers.
Columbus — Jan., June, Sept., Fort Haves Hotel.
Cleveland, 3rd Friday, Cleveland Engineering & Scientific Center.
Dallas, 1st Thursday after 2nd Monday, Melrose Hotel.
Detroit, 4th Tuesday, Rackham Building.
Golden Gate, 3rd Monday, Sabella's Restaurant, San Francisco.
Houston, Monday prior 2nd Tuesday, Rams Club.
Kansas City, 2nd Thursday, Pickwick Hotel.
Los Angeles, 2nd Wednesday, Scully's Cafe.
Louisville, 3rd Wednesday, Seelbach Hotel.
Montreal, 1st Wednesday, Queen's Hotel.
New England, 3rd Thursday, University Club, Boston.
New York, 1st Thursday, Brass Rail, 100 Park Ave.
Northwestern, 1st Friday, St. Paul Town and Country Club.
Pacific Northwest, 3rd Thursday, Washington Athletic Club, Seattle, Wash.
Philadelphia, 3rd Wednesday, Philadelphia Rifle Club.
Pittsburgh, 1st Monday, Gateway Plaza, Bldg. 2.
Rocky Mountain, 2nd Monday, Republican Club, Denver, Colo.
St. Louis, 3rd Tuesday, Kings-Way Hotel.
Southern, Annual Meetings Only.
Toronto, 3rd Monday, Oak Room, Union Station.
Western New York, 1st Monday, 40-8 Club, Buffalo.

POLYVINYL ACETATE

(*From page 48*)

reduced the magnitude of dimensional changes in the film resulting in a reduction of its tendency to pull away from the substrate.

The best way of handling a heavy deposit is still to remove it. Oil base conditioners sometimes give good results but sacrifice the water-vapor permeability of the system and may give adhesion difficulties or alligatoring if applied over areas where no chalk deposits exist.

Roof Coatings

Another relatively new development is the increased use of vinyl acetate copolymers as built-up roof components and in roof coatings and paints of several kinds. Most systems start with an asphalt base roofing. In one case this is surmounted by a layer of PVA based mastic in which are embedded pieces of special aggregate. Both mastic compound and aggregate are usually colored and sometimes they are further coated with a clear layer of PVA. A second system involves embedding a cheaper type of aggregate in the asphalt and covering both it and the asphalt with a special type of colored PVA paint. Copolymers are preferred in both these applications because of the possibility of plasticizer evaporation or migration into the asphalt. Formulae F and G of the appendix give formulations of the type used for the mastic compound and for the special paint respectively.

Of course we expect that developments in the polyvinyl acetate coating' field will continue and even accelerate in the future. Today, there are available in pilot laboratory quantities "emulsifier-free" vinyl acetate copolymer emulsions. These materials are still in the development stage and their full impact on the coating industry will not be felt for some time. It is clear, however, that these products which yield dry films containing virtually no water extractable materials will have many uses in coatings as soon as the problems connected with producing them in commercial quantities are solved.

Another development which is already in progress and which we may expect soon to bear fruit has to do with modifying the basically thermoplastic properties of these resins so that they may be used in baking-type finishes for industrial use. There is tremendous interest currently in the industrial finish field in water base products to replace the solvent type lacquers. enamels and primers now in use, We are dealing here with some of the more basic properties of the polyvinyl acetate such as its water permeability and its thermoplastic nature. Even these may be drastically modified, however, through the mechanism of copolymerization or through various grafting techniques. We fully expect to see a number of types of thermosetting vinyl acetate polymers and copolymers on the market and feel that they will probably be useful in at least some types of water-base industrial finishes.

In concluding I would like to sum up all of the foregoing remarks by saying that we in the polyvinyl acetate industry have done, and will continue to do, everything in our power through our applications research efforts to make presently available forms of these resins do the jobs you in the coatings industry want done. Where the inherent properties of our currently available products make them unsuitable for some of these jobs, we have not given up but, through our research activities, are doing something about it. We are confident of the future of PVA in the coatings industry and are making heavy investments in research and in plant to back it up.

•

Emery Moves Office

Emery Industries, Inc., has moved its branch sales office to 751 Main St., Waltham 54, Mass., from its former location in Lowell, Mass.

Emery's chemical sales representatives, John A. Condon and Walter R. Paris of the organic chemical sales department and Tom W. Macy of the fatty acid sales department, will make the new office their headquarters for their New England territories. A warehouse operation will be maintained in Boston to service these departments, as well as Emery's Sanitone Division.

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- ☐ Chippendale Shellac
- ☐ Orange Flake Shellacs

NAME.....

COMPANY.....

ADDRESS.....

CITY.....

STATE.....

NATURE OF BUSINESS.....

RESEARCH—THE KEY TO PAINT PROGRESS

By
Dr. William E. Holland*

RECENTLY, a system whereby a car can almost "drive" itself" on the highway with no more guidance than a painted line was outlined before a meeting of the Institute of Radio Engineers. The system relies on an auto-radar installation and a special metallic paint line on the highway from which it picks up a signal. Paint may someday be part of a system that will save millions of lives and dollars.

New uses of paint and other protective coatings are constantly being found. Outer space is one of the latest places in which we find new paint applications.

The do-it-yourself enthusiasts provide a constantly growing market for paint and related products. For one thing, increased sales outlets, including specialty paint and wallpaper shops, drive-in centers, and supermarket-type service stores, make it easier for the home handyman or lady. The use of paint rollers has been a major contributor to the growth of this market. Home-use paint formulations are now easier to apply, faster drying, and practically odorless. Exterior paints are longer-lasting and blister-proof, and in general withstand all the elements better than ever.

Aerosol packaging has been promoted successfully for small paint jobs and furniture spraying. The importance of these dispensers is seen in their sales growth of 500% in the past five years. amounting in 1958 to about 60 million cans. Another new selling device is a colorant-dispensing machine which features push-button operation and which makes over 1,500 color combinations instantly available.

In industry and business, there has been a recent growth in the number of interesting paint applications. The automobile industry is looking forward to the use of fast-drying plastics and rubber-based finishes that are fireproof and that provide brilliant new color combinations. Besides the new acrylic finishes, paints with a high melamine content are effecting a revolution in the automobile industry.

Oil companies and refineries are using paints that change color at high temperatures to detect "hot spots" on refinery walls. Such color-changing paints are being used in other industrial processes to warn that temperatures have reached a critical point. Tank cars are being color-coded to identify their contents at a glance. Paint films, only one-thousandth of an inch thick, are being used to protect bridges and cause-ways. Paints are now keeping tools and storage tanks rust-free. Brightly colored paint on critical machinery parts has proved to be a boon to safety.

Among the latest developments announced are leak-detection paints which locate gas escaping from extremely minute fissures, flexible coatings to substitute for cement in resurfacing tanks, bridges, and grain elevators, paints that absorb "ultraviolet" light for rooms where it is given as a medical treatment, "cool" acrylic white coatings for agricultural use to protect animal shelters, and new antiseptic pigments to prevent spreading of disease in public places.

New applications of paint in rockets, missiles, and supersonic aircraft probably most strikingly illustrate the revolutionary developments taking place in the paint industry. Superior coatings for rocket engine housings have been developed which have high resistance, toughness, and low heat absorption. White stripes that reflect the sun's scorching rays, crisscrossed with black stripes that absorb them, keep delicate instruments from burning up or freezing as a rocket hurtles through outer space. Jet engines required paints that could resist special lubricating oils and the sudden temperature changes produced by sonic and supersonic speeds. Epoxy resins

*Development Manager, Evans Research & Development Corp., New York, N. Y.

and acrylic and nitro-cellulose lacquers helped solve both these problems. Also, paint helps to caulk gaps in the aircraft's metal surfaces, thus achieving increased aerodynamic efficiency by attaining an extremely smooth surface on which air can flow freely. Our faster-than-sound military jets are being coated with fluorescent paints for maximum visibility. Fluorescent paints as an added safety factor in flight are also being used more and more for civilian aircraft.

The Future

What has all of this activity meant to the paint industry? Paint has spread into uses never dreamed of by its earlier manufacturers. Paint can no longer be considered simply as decoration. It has changed from an "art" to a science that represents a vital branch of the vast chemical industry. Prior to World War II, relatively little was known of the chemistry of paint. It has now become a field where needs change rapidly, where a great challenge for creative work exists and where opportunities are unlimited.

Where does the industry stand in view of the ever-increasing challenges and requirements? From all available reports and sales figures, the industry on the whole has fared exceptionally well despite competition from construction materials which do not require painting and despite the recession which had depressed some of its important customer industries. In 1957, the paint, varnish, and lacquer industry reached a new high of $1,600,304,000 in sales at fractory level, an increase of $20 million over the previous year. This compares with $20 million over the previous year. This compares with $464 million prior to World War II. And the first 10 months of 1948 sales ran approximately 7% higher than the year before. Undoubtedly, to make such a healthy showing, the paint industry had to overhaul its operations completely to effect a better competitive shape; it had to revamp its advertising techniques and merchandising outlets; and above all, it had to step up research greatly to achieve a series of technological successes which transformed paint from a run-of-the-mill product, to a versatile and specialized chemical formulation.

Stepped-up spending in research is by no means peculiar to the paint industry. Post-war years have ushered in tremendous technological advances occurring at a phenomenal rate of speed. What happened to many long-established individual industries who loped along at a leisurely technological pace also happened to the paint companies. The smaller firms, because of their difficulty in financing adequate research facilities and staff necessary for survival, were swallowed up by their competitors. Statistics show that whereas paint manufacturers in the past have held as much as 44% of the market, today they are enjoying less than 40%, and even this percentage will continue to be threatened. Thus the need for technical men for future product development and evaluation of new raw materials is as great as ever for smaller and medium-sized paint companies as well as the larger and better-financed ones. The relentless pressure for new products is being felt by everyone, and only an experienced research staff can begin to cope with the wide variety of problems that plague new product research efforts.

Larger and well-financed paint makers maintain their own research laboratories and technicians—one boasting more than 600 technicians. But the new demands from paint users tax the ingenuity and knowledge of all paint-makers, large and small. The most feasible way smaller companies can solve their research needs is to organize into industrial societies and associations which enable the pooling of funds for research activities. The era for secret formulations is past, and a definite need for improved communications is required. By pooling resources for the retention of an independent research laboratory, associated members individually profit from complete investigative services for analyzing the possibilities of new raw materials, the development and testing of new paint formulations or new methods for applying paints. In this way, each manufacturer benefits from the knowledge of the other manufacturers' problems and from the solutions to these problems.

One of the most substantial arguments in support of using "outside" research is the need for the paint chemists to be aware of advances in other fields. Independent research centers are even more diversified than those of many large chemical companies since they are not restricted to the interests of one field or one manufacturer. In many instances, ideas for solving problems often come from apparently unrelated fields.

Research Needs

Some of the more immediate research needs now being investigated or ripe for investigation are:

Deodorant chemicals to nullify offensive paint odors and give a fresh, clean smell.

Aerosols—specifically the modifications of propellant systems and the pressure-packaging of new paint formulations such as water-based coatings.

Coatings with specific insulating or conductive properties.

Improve the characteristics of epoxy resins, polyvinyl acetals, polyurethanes, polysulfides, vinyls, fluorinated resins, and silicones which are useful because of their electrical properties.

Water-based topcoats for automobiles to reduce the use of millions of gallons of thinners and reducers now necessary.

The use of epoxidized vegetable oils as raw materials for protective coatings for toughness, improved aging properties, increased adhesion, and better corrosion resistance.

The development of "skins" which can adhere to unusual plastic surfaces to protect foamed structures such as foamed rubber, foamed neoprenes, and foamed polyurethanes.

From these possibilities, we can conclude that the paint industry has a brilliant future, that it will also be a very competitive one. The paint industry will face competition which can only be offset by modern research techniques and a well-trained scientific staff, experienced in paint component development and in all phases of the vast chemical field.

NEWS

NEWS OF COMPANIES, ASSOCIATIONS
TECHNICAL GROUPS
ITEMS OF GENERAL INTEREST

Viscosity Symposium Set for Cleveland

A symposium on the viscosity and flow properties of paint will be held September 10-12 at the Case Institute of Technology, Cleveland, Ohio. The symposium is sponsored by the Cleveland Paint & Varnish Production Club, the Cleveland Paint & Varnish & Lacquer Association, and the Case Institute of Technology.

The program is as follows:

September 10
1:00 P.M. Chairman: J. C. Weaver
Introduction — R. M. Evans
Types of flow — S. H. Maron
The problems of flow measurement — R. R. Myers
How related industries measure flow properties
Paper — W. R. Willets
Ink — A. C. Zettlemoyer
Paint — M. W. Westgate
Adesives — H. L. Jaffe
Plastics — W. P. Cox

September 11
1:30 P.M. Chairman: W. von Fischer
How flow properties affect production
Non-aqueous — A. C. Zettlemoyer
Aqueous — E. E. Baumhart
How flow properties affect application
Non-aqueous — W. K. Asbeck
Aqueous — B. S. Garrett

September 12
9:00 A.M. Chairman: D. M. Gans
Flow-control additives
Thickeners
Water-soluble — H. L. Jaffe
Non-water soluble — H. M. Metz
Metallic soaps — F. J. Licata
Surface active agents
Aqueous systems — W. F. Scheufele
Non-aqeous systems — E. Singer
Summation of the symposium — E. G. Bobalek

•

National Starch Purchase

National Starch and Chemical Corp. has announced the purchase of Polimeros S. A., a manufacturer of vinyl acetate polymers, located in Mexico City.

Donald E. Reese, the founder of Polimeros S. A., will continue as president of the Mexican company which will operate as a wholly owned subsidiary.

Production from this plant has been used primarily by the paint industry for the manufacture of latex paints. Additional equipment will be installed so that a complete line of vinyl acetate polymers and copolymers, as well as adhesives for the packaging, structural and furniture industries, may be made.

•

Inland Steel Addition

A 78,000-square feet addition to Inland Steel Container Company's Jersey City plant houses a steel pail manufacturing facility said to be designed to produce containers at a faster rate than any other in the country.

Built at a cost of $2,750,000, the steel pail-making facility, a division of Inland Steel Company, is geared to perform at a top line speed of 2400 pails per hour.

The entire facility is designed for quick change. In minutes, if need be, the production line can be adapted to a new pail product. In addition, enlarged warehouse facilities permit the company to inventory a wide range of various types and sizes of steel pails, which can be delivered to customers on short notice.

•

New Reichhold Plant

Reichhold Chemicals, Inc., will construct a $4 million maleic anhydride plant at Elizabeth, N. J., it has been announced.

Capacity of the new facility, which will be adjacent to RCI's existing plant at Elizabeth, will be 20 million pounds per year and will significantly enhance the company's competitive position as a supplier of this important chemical.

Plans call for the plant to go on stream in early June, 1960.

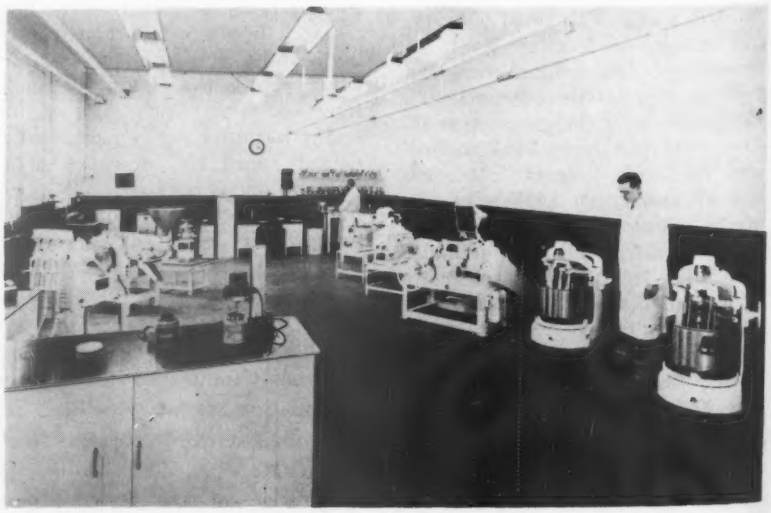
•

Skinner Purchases Troy

The Skinner Engine Co. has announced the purchase of the power equipment and process machinery divisions of the Troy Engine and Machine Co. Skinner becomes the exclusive supplier of all new equipment, together with parts and service for products formerly manufactured by the Troy Engine and Machine Company.

Products in the newly acquired line include Troy engines, Troy-Engberg engines, American Blower engines, Whitin engines, Erie Ball engines and Troy Processing Equipment.

Under the terms of purchase, Skinner Engine Company will be furnished all engineering data, patterns, jigs, and fixtures for the production of new Troy steam engines, as well as repair parts for existing engines. In addition, the Skinner Engine Company will also receive all research, development, experimental and engineering specifications, and will be appointed exclusive licensee for Troy Differential-Pressure Power Units (Expander Engines).



CUSTOMER SERVICE CENTER: The J. H. Day Co. has announced expanded facilities for chemical processing techniques at its new Center in Cincinnati. Shown here is the west area laboratory, with mixing and milling equipment.

NEWS

Woodman to Give Federation Talk

The Federation of Paint and Varnish Production Club has announced that Herbert B. Woodman, president of Interchemical Corp., will deliver the Keynote Address at the 37th Annual Meeting of the Federation which will be held in Atlantic City from October 22-24, 1959.

Mr. Woodman has been scheduled to speak at the Friday morning session, October 23rd, which will be held in the American Room of the Traymore Hotel. He has been President of Interchemical since 1947.

Mr. Woodman was born in Cheyenne, Wyoming, in 1904, the son of a commercial printer. He attended the Cheyenne public schools and matriculated at the University of Wyoming, at Laramie, with the idea of studying journalism.

Late in his college career Mr. Woodman's interests changed from journalism to law. He entered Harvard Law School in 1925 and during his second year in law school was awarded a Rhodes Scholarship. He was admitted to the bar in Wyoming before going abroad to study jurisprudence for three years at New College, Oxford. He became associated with the New York law firm of Cravath, de Gersdorff, Swaine and Wood on his return from England in 1930. Assigned to work for Interchemical a few years later he was invited to join the corporation as secretary and vice-president in 1936.

•

Staley Acquires U B S

The stockholders of the U B S Chemical Corp. at Cambridge, Mass., voted to authorize the acquisition of U B S by the A. E. Staley Manufacturing Co., Decatur, Ill., through the exchange of 1¾ shares of U B S for each 1 share of Staley's.

The acquisition of U B S by the Staley Company is expected to add impetus to Staley's research and polymer chemicals as well as aid in the growth and diversification of their product line. However, U B S will initially continue to operate as an autonomous unit with Paul W. Atwood continuing as its president.

COMPANY EXPANSION: Facilities expansion of The General Tire & Rubber Company's Mogadore, Ohio chemical plant is shown in this general view of the new latex reactor area. The $350,000 expansion provides for a 50% increase in capacity for manufacturing paint, and textile latices at the multi-product plant.

•

Cyanamid to Expand

American Cyanamid Company has announced plans to expand the capacity of its nearly completed maleic anhydride plant at Bridgeville, Pa., from 14 million to 20 million pounds annually.

Provision for this and further expansion was made in the initial installation, which is expected to be on stream before the end of this year.

Construction of additional production facilities will begin immediately, and the expansion is expected to be completed in about nine months.

•

Baltimore Acquires Merkin

Acquisition of all outstanding stock of the M. J. Merkin Paint Co., Inc., New York, by the Baltimore Paint & Chemical Corp. has been announced.

Michael Merkin will continue as president of the M. J. Merkin subsidiary and will become vice-chairman of the Baltimore Paint & Chemical board. The Merkin company will continue its manufacturing and sales activities as a separate organization, retaining its present management and operating personnel.

•

Underwriters' Approval

Lewis-Shepard has been granted the Underwriters' Laboratories approval for Type "E" and "EE" construction for SpaceMaster Model "E" electric fork lift trucks. The approval covers a listing of 36 different models in the "E" line for operation in hazardous locations as classified by the National Fire Protection Association.

•

Philadelphia Club Schedules Seminars

The Philadelphia Paint and Varnish Production Club's technical committee is sponsoring a series of six seminars on *The Physical Chemistry of Interfaces Related to Coatings.*

All sessions will be held at the Philadelphia Rifle Club, 6th and Tabor Avenues, Philadelphia. The schedule is as follows:

October 6—**General Introduction**
November 10—**The Gas/Liquid Interface**
January 11—**The Liquid/Liquid Interface**
February 1—**The Solid/Liqud (aqueous) Interface**
March 7—**The Solid/Liquid (nonaqueous) Interface**
April 4—**The Solid/Solid Interface**

NEWS

Exhibit Space Filled For 1959 Paint Show

Dr. Fred C. Weber, chairman of the Paint Industries' Show Committee of the Federation of Paint and Varnish Production Clubs, has announced that all exhibit space in the Paint Industries' Show for 1959 has been assigned.

The Show will be held in the Lower Hall of the Atlantic City Convention Hall from October 20 thru 24, 1959.

Once again the Show will bring to Federation members and visitors technical and engineering advances in the industries supplying materials and equipment to the paint, varnish, lacquer printing ink, and allied industries. New products, new knowledge relating to existing products and their uses or, in some cases, existing knowledge which is not generally available to the consuming industries will be featured. New equipment and new applications of existing equipment will also be demonstrated.

Some 106 exhibitors will occupy more than twenty thousand square feet of exhibit area making this year's Show the largest ever presented.

NEW CPD PLANT: The Calcium Products Division of the Georgia Marble Co. has opened a sixth plant to increase production of its calcium products. The new $100,000 plant will produce Wingdale White. A portion of the plant is shown above. The bags in front contain stones, all imported from Europe for tube mill grinding.

FORTY-EIGHT YEARS SERVICE: A. C. Dodge, personnel director of Standard Ultramarine and Color Company, standing center above, is pictured presenting a specially designed service pin to Major Henry Dourif, the company's president. The pin was given in recognition of Major Dourif's 48 years of service to SUCO.

Dow Announces Plans

The Dow Badische Chemical Company has announced plans to produce acrylic acid and methyl, ethyl, butyl and other acrylic esters at a plant under construction near Freeport, Texas.

Production is expected to begin next January, following completion of the plant in December. Construction has been in progress for the past eight months at a site adjacent to The Dow Chemical Company's Texas Division.

The Company, capitalized at $6,000,000, is owned jointly by Dow and BASF Overzee, N. V., a subsidiary of Badische Aniline-& Soda-Fabrik AG of Ludwigshafen a. Rhein, Germany.

•

Allied Increases Production

Plans to increase maleic anhydride production to satisfy increased customer demands have been announced by Allied Chemical's National Aniline Division.

Operating facilities at Moundsville, W. Va. and Buffalo, N. Y., are being expanded. Both expansions are expected to be completed during the last quarter of this year and will increase the availability of maleic anhydride in rod, tablet, and molten forms.

•

New CIBA Plant

CIBA Products Corporation has announced that plans are proceeding for the building of a new plant to produce epichlorohydrin, the basic raw material used in the production of epoxy resins. The new plant will be located at Toms River, N. J.

•

Kohnstamm Proposal

On May 13 of this year the Food and Drug Administration granted approval to a proposal put forth by H. Kohnstamm & Co.

The Kohnstamm proposal requested a change in the color certification regulations applying to the lakes of the F D & C colors in order to permit certification for their use in or on all foods. Prior to this action, the only pigments approved for use in foods were NF Titanium Dioxide, Purified Carbon Black and NF Carmine.

Now synthetic organic pigments will also be available, offering a wide range of color choice for users. These food color lakes, in accordance with the new F. D. A. regulations are made by extending on a substratum of alumina, a salt prepared from one of the certified water soluble straight colors by combining such color with the basic radical aluminum or calcium.

•

New McAdam Office

T. F. McAdam, a supplier of drying oils and related products to the paint industry, has opened a new office at 103 Cornelia St., Boonton, N. J.

PERSONNEL CHANGES

INTERNATIONAL FLAVORS

C. Ray Sanders has been appointed manager of the West Coast division, it has been announced.

C. R. Sanders

Mr. Sanders responsibilities will include administration of the West Coast branch, as well as direction of sales operations of the company's van Ameringen-Haebler Division and the Polak & Schwarz Division in eleven Western States. He will make his headquarters at the company's new branch office in Los Angeles.

COMMERCIAL SOLVENTS

John P. Cheevers has joined the sales staff, it has been announced.

He will be headquartered at the Cincinnati district office.

Mr. Cheevers attended St. Joseph's College and the University of Illinois.

Prior to joining the firm, Mr. Cheevers was associated with the Glidden Company.

NATIONAL CAN

Arthur R. Jorgensen has been appointed North Atlantic district sales manager, it has been announced.

Mr. Jorgensen came to the company 29 years ago. He worked in purchasing, credit and inside and outside sales before he was appointed assistant sales manager of the North Atlantic district.

Mr. Jorgensen will continue to headquarter at the firm's New York offices.

STANDARD OIL

John B. Stobbart, who joined the sales technical service division of the company in 1955, has been named solvent co-ordinator, general office sales, developing the sale of special naphthas and solvents, it has been announced.

He will maintain an office in Cleveland, Ohio.

A graduate of Miami University, at Oxford, Ohio, in 1944 with a major in chemistry, Mr. Stobbart spent 11 years in the field of commercial solvents, including work in technical development, sales, service in industrial chemicals, solvents, anti-freeze and other specialty chemical products with Nopco Chemical Company; Wiley & Lett, Inc., and Commercial Solvents Corporation, before joining the firm.

CENTURY CHEMICAL

John W. Stevens has become vice president, marketing, it has been announced.

In his new capacity, Mr. Stevens will work on planning, organizing and integrating all marketing and sales activities in the United States and abroad.

Mr. Stevens comes to his new position with extensive experience in marketing, sales planning and sales distribution, and market analysis. Before joining the firm, he was vice president in charge of marketing and sales for Reichhold Chemicals, Inc. He has also served as general sales manager for Celanese Corp. of America's chemical operations.

He is a 1940 graduate of Princeton University.

UNION CARBIDE CHEMICALS

Lee A. Roebke has been promoted to group leader in the quality control laboratory, South Charleston, W. Va., it has been announced.

He heads a technical group responsible for special inorganic analyses, special specification analyses, and physical properties determinations.

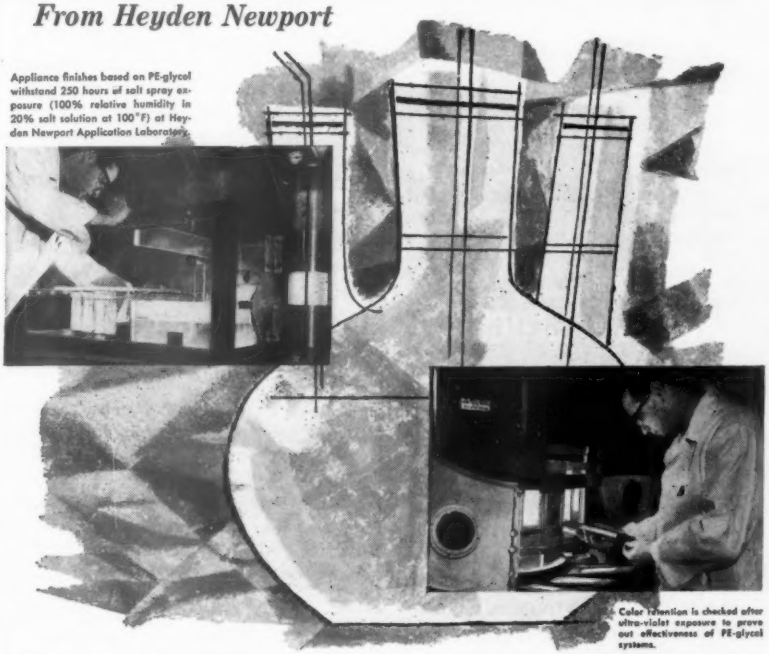
In 1940, Mr. Roebke received a Bachelor of Arts degree in Chemistry from Miami University, Oxford, Ohio, and joined the quality control laboratory that same year.

GALLOWHUR CHEMICAL

Henry Gould has been named technical director, it has been announced.

Mr. Gould, who joined the company last year as chief chemist, is a graduate of City College of New York, and carried out post graduate research in chemistry at Brooklyn Polytechnic Institute. He has had more than 20 years experience in research and development in the organic and agricultural chemicals industries.

From Heyden Newport



Appliance finishes based on PE-glycol withstand 250 hours of salt spray exposure (100% relative humidity in 20% salt solution at 100°F) at Heyden Newport Application Laboratory.

Color retention is checked after ultra-violet exposure to prove out effectiveness of PE-glycol systems.

Three new areas of PENTAERYTHRITOL application

Pentaerythritol is gaining new importance to paint chemists and allied chemical specialists as a result of development work at Heyden Newport. Check these three new areas that can be of profitable interest to you.

ALKYD EMULSIONS. The application advantages of latex paints plus the outstanding properties of the alkyd system is a combination offering formulators new sales potentials. Data are now available on the formulation and processing of PENTEK® based alkyd emulsions, excellent vehicles for water-based flat wall paints and industrial primers.

IMPROVED ALKYDS FOR FLAT PAINTS AND INDUSTRIAL FINISHES. Medium and short oil alkyd formulations – taking advantage of high quality, low cost PENTEK-glycol combinations – can be processed in standard equipment. Details on formulation and processing are available.

NEW HORIZONS. Pentaerythritol and its esters are finding increasing use in intumescent coating, plastic stabilizer, and plasticizer applications. Certain pentaerythritol derivatives are now showing considerable promise as lubricants and functional fluids.

1959

HEYDEN NEWPORT

Heyden Newport Chemical Corporation
342 Madison Ave., New York 17, N. Y.

Where tradition meets tomorrow in chemical progress

HEYDEN CHEMICAL DIVISION
Heyden Newport Chemical Corporation
342 Madison Avenue, New York 17, New York

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- ☐ Please send data on the formulation of Pentek-glycol alkyds.
- ☐ Please send PENTEK® Brochure.
- ☐ Please add my name to Heyden mailing list.

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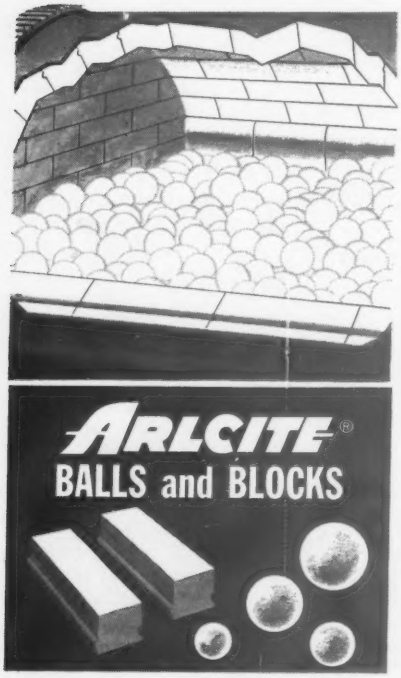

High-density ARLCITE grinding media goes hand-in-hand with today's modern mill practices to *speed production* and *lower operating costs.*

Only ARLCITE has the optimum balance between high density and bonding qualities to give you up to 50% faster grinding while extending service life over 300%. Exclusive tongue-and-groove feature insures a tightly-keyed lining which remains firmly in place. Write for fact filled Bulletin.

PORCELAIN DIVISION
FERRO CORPORATION
East Liverpool, Ohio

DEWEY & ALMY

Harry R. Marty has been appointed manager of the new Owensboro plant, it has been announced.

He succeeds **James F. Murphy, Jr.,** assistant chief engineer, who was project manager in charge of construction and start up of the plant.

J. F. Murphy, Jr.

H. R. Marty

Mr. Marty has been manager of the development department.

The plant's manufacturing facilities for organic chemicals and battery separators will be operated by Mr. Marty under the direction of **Thomas G. Gibian,** general manager of the organic chemicals division, and **Russell L. Haden, Jr.,** general manager of the battery, polyfibron, and textile division.

Mr. Marty joined the firm in 1950 as process development engineer, after serving with the Koppers Company, Inc., and the Office of Rubber Reserve. He was appointed development manager of the organic chemicals division in 1955.

He received a B. S. in Chemical Engineering from the University of Missouri in 1943.

CONTINENTAL CAN

Hazen P. Master has been appointed an assistant products sales manager in the metal division, it has been announced.

Mr. Master, formerly a sales representative in the company's Syracuse district, will be headquartered in New York and handle F-style cans and paint containers.

JONES-DABNEY

Charles Lorenz has been appointed sales representative in the Minnesota territory, it has been announced.

He replaces Larry Hagen who plans to retire this Fall.

Mr. Lorenz, who has been employed by the firm for five years, is a graduate chemist, University of Louisville, with a background of experience in both the sales and laboratory operations of the company.

VAC-U-LIFT

David Van Sluyters has been appointed to the management staff, it has been announced.

Mr. Van Sluyters will develop sales promotion and advertising material to be used by authorized firm agents.

WATER GROUND
MICA

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EXTENDER PIGMENTS
for:
PRIMER-SEALERS
HOUSE PAINTS
LATEX-EMULSIONS

FRANKLIN MINERAL PRODUCTS
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FRANKLIN, NORTH CAROLINA
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Agents in Principal Cities

CLASSIFIED ADVERTISEMENTS

Rates: $.20 per word, except those seeking employment, for which rate is $.10 per word. Minimum: ten words. Address all replies to Box Number, c/o Paint and Varnish Production, 855 Avenue of the Americas, New York 1, New York.

PAINT CHEMIST

Challenging opportunity for B.S. or Ph.D with 5 to 15 years experience. Development, application research, and customer service work in all types of protective coatings. Some travelling. Experience in hydrocarbon, alkyd, epoxy, acrylic, and latex formulating, and emulsions of all types helpful. New, well-equipped, air conditioned laboratory. Moving expenses paid. Excellent benefits. Send resume to William Ittel, NEVILLE CHEMICAL COMPANY, PITTSBURGH 25, PENNSYLVANIA.

PAINTS WANTED

We will buy your excess inventories—we do not sell the paint as is, but rework it. Send your inventory list (we probably won't need a sample) or call collect. Walnut 5-0030. MICHIGAN INDUSTRIAL FINISHES CORP., 9045 Vincent, Detroit 11, Mich.

WESTERN PETROCHEMICAL

Maurycy Bloch has been named president of the newly-formed corporation, it has been announced.

M. Bloch

Mr. Bloch was formerly vice president and general manager of Warwick Wax Company, subsidiary of Sun Chemical Corporation, whose assets were recently acquired from Sun by Western Petrochemical.

In addition to serving as corporation president, Mr. Bloch will also function as chief executive of the Warwick Division.

Mr. Bloch joined Warwick in 1944. In 1946 he became Midwestern sales manager and two years later was made national sales manager. In 1949 he was named vice president and, in 1950, general manager and director of the subsidiary.

FITZGERALD

Jack Weisman is now associated with the company, it has been announced.

Mr. Weisman has a B. S. in chemistry and additional graduate chemistry courses at Illinois Tech and University of Chicago.

He spent three years with Sherwin-Williams in their resin research lab as a research and developement chemist in the field of paint vehicles generally and alkyds in particular.

In 1947 he became a salesman for Falk & Company.

Cargill acquired Falk & Company and in 1953, Mr. Weisman was named co-sales manager of the Chicago office.

In 1957, Mr. Weisman was made midwest manager of Cargill's technical sales service.

PITTSBURGH PLATE

A series of appointments in the research and development department of the paint division has been announced.

Richard T. Ubben has been appointed division technical director succeeding **Dr. W. W. Bauer** who is working on a technical assignment overseas. Mr. Ubben transferred to the company's Springdale, Pa., research center from the Milwaukee paint factory where he had served as assistant division technical director for the past several years.

Robert P. Ericson has become assistant division technical director, with headquarters at Springdale. Mr. Ericson, formerly technical director at the company's East Point, Ga. paint factory during the past three years, joined the firm in 1941 as a chemist at Newark.

R. E. Mutzberg has been named technical director, succeeding Mr. Ericson at the East Point plant. Prior to his appointment, Mr. Mutzberg had served as head of the can coatings development department at Newark during the past ten years.

GENERAL MILLS

John Chadwick has been appointed San Francisco sales representative for the Chemical Division, it has been announced.

Previous to his assignment to the new post, Mr. Chadwick had been a trainee in the division's technical service department in Kankakee. Before joining the firm in 1958, he had taken a B.S. in chemistry at Marshall college.

In his new position, Mr. Chadwick will be responsible for sales of Versamid polyamide resins, Genamid epoxy curing agents, fatty nitrogen chemicals, and other specialty chemical products in the San Francisco, northern California, Oregon, and Washington areas.

ORONITE

W. K. Venatta has been appointed manager of the manufacturing department, it has been announced.

Mr. Venatta will be headquartered at the home office in San Francisco. He joined the firm in 1948 and for the past two years has been manager of the Oak Point, La., plant.

Prior to his present association, Mr. Venatta was with California Research Corp.

He is a chemical engineering graduate of the University of Wisconsin.

J. T. Deane, vice president of manufacturing, will retire November 1, it has also been announced. Mr. Deane is also a director of the firm.

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VISCOSITY	V-Y
NON-VOLATILE	30% ± 1%
COLOR	6 Maximum
ACID NO.	10 Maximum (on solids)
WEIGHT per gal.	7.3 lbs.
TYPE	Pure drying oil alkyd

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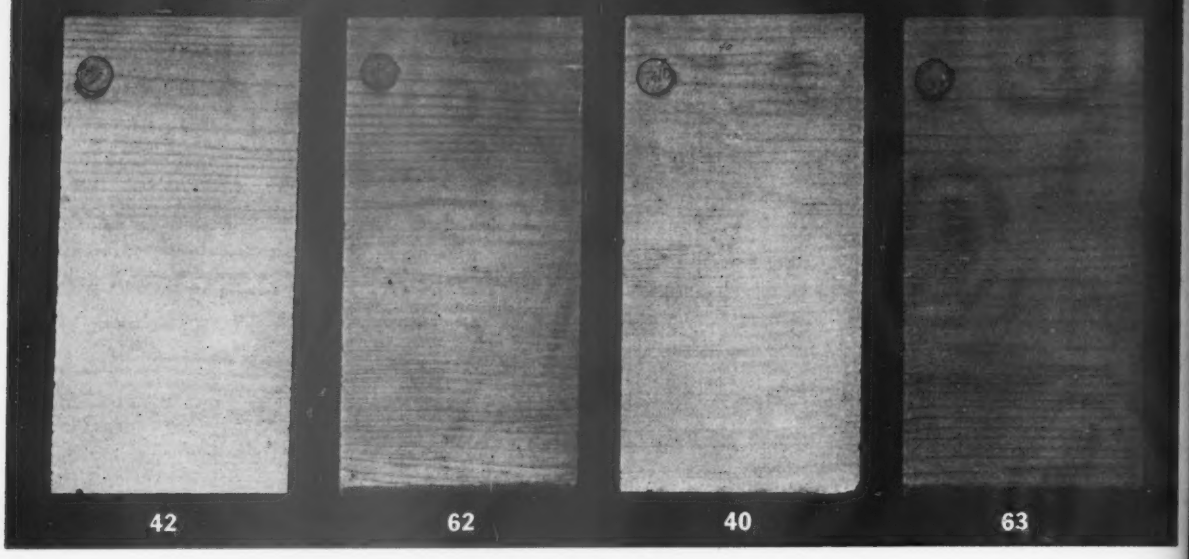

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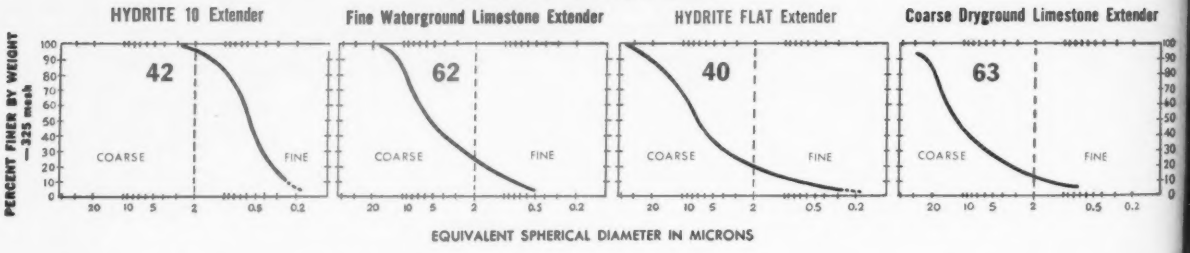

In exterior emulsion paints, Hydrite Kaolinite Aluminum Silicate Extenders impart superior properties of clean-up *with* durability.

The photograph shows four panels painted with white exterior emulsion paint. Panels 42 and 40 were extended with Hydrite 10 and Hydrite Flat respectively, a fine and a coarse Hydrite Kaolinite extender. Panels 62 and 63 were extended with a fine waterground and a coarse dryground limestone respectively.

These panels were exposed to the weather for eighteen months by the Sub-Tropical Testing Service, Miami, Florida. Exposure was due south, all panels at 45° with the vertical. Note the relative whiteness of Panels 42 and 40, using non-reactive Hydrite Kaolinites, as compared with 62 and 63, the comparative darkness of which indicates some reactivity between vehicle and extender. The panels clearly show, also, that aluminum silicate extenders aid materially in reducing mildew growth. Note the dark line of mildew at the bottom of Panels 62 and 63 and compare with the clean appearance of Panels 42 and 40.

Chalking rates of exterior emulsion paints vary with particle size distribution of Hydrite Kaolinite extenders. GK's super-centrifuging technique provides the widest range of controlled particle size distribution. Therefore, formulators using Hydrites have the broadest possible latitude in selecting the optimum combination of clean-up *and* durability.

Consult GK technical service for further information.

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